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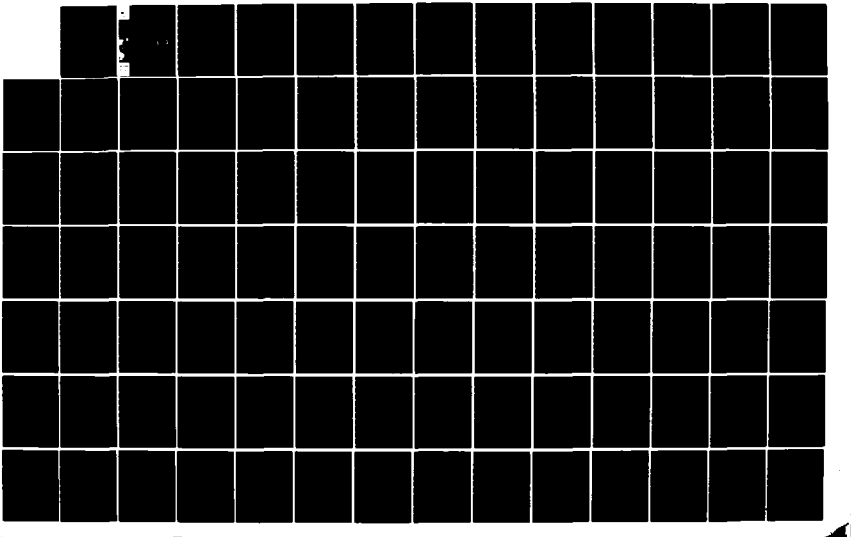

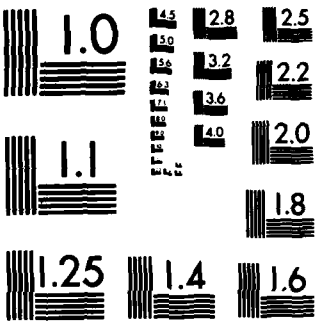

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TECHNICAL REPORT HL-82-15

THE ATCHAFALAYA RIVER DELTA

Report 9

WIND CLIMATOLOGY

by

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This report contains a description of the wind climate typical of the Atchafalaya Bay area. Frequencies of occurrence of various synoptic circulation patterns as well as statistical estimates of wind speed and direction for each pattern are given. The seasonal variation of the wind climate is investigated. Prototype wind data used in this study are comprised of 15 years of long-term data from New Orleans and Lake Charles and 1 year of data measured

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20. ABSTRACT (Continued).

within the Atchafalaya Bay. Some shipboard observations are included as well. Statistical information includes frequencies of occurrence, estimates of duration, and historical extremes.

PREFACE

This report presents an analysis of the wind climate within the Atchafalaya Bay, Louisiana. This study was supported as a reimbursable project within the Estuaries Division, Hydraulics Laboratory, US Army Engineer Waterways Experiment Station (WES), Vicksburg, Mississippi, for the US Army Engineer District, New Orleans, Louisiana.

The study was conducted under the direction of the following WES personnel: Messrs. H. B. Simmons, Chief of the Hydraulics Laboratory (Retired); F. A. Herrmann, Jr., Chief of the Hydraulics Laboratory; R. A. Sager, Assistant Chief of the Hydraulics Laboratory; W. H. McAnally, Jr., Project Manager; and J. V. Letter, Jr., Task Coordinator. This study was performed by Mr. Bruce A. Ebersole, formerly of the Wave Dynamics Division (WDD), Hydraulics Laboratory, under the direct supervision of Dr. R. W. Whalin and Mr. C. E. Chatham, Jr., former and acting Chiefs of WDD. The WDD and its personnel were transferred to the Coastal Engineering Research Center (CERC), WES, on 1 July 1983, under the direction of Dr. R. W. Whalin, Chief of the Coastal Engineering Research Center.

Commanders and Directors of WES during the study and the preparation and publication of this report were COL John L. Cannon, CE, COL Nelson P. Conover, CE, COL Tilford C. Creel, CE, and COL Robert C. Lee, CE. Technical Director was Mr. F. R. Brown.

CONTENTS

CONVERSION FACTORS, US CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

US customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
feet	0.3048	metres
knots (international)	0.514444	metres per second

THE ATCHAFALAYA RIVER DELTA

WIND CLIMATOLOGY

PART I: INTRODUCTION

1. This task of the Atchafalaya Bay investigation is an investigation of the different wind conditions that typically influence the Atchafalaya Bay system. Wind fields play an important role in determining the hydrodynamics not only within the bay itself but also in those portions of the Gulf of Mexico that surround the bay. Along with astronomically induced currents and riverine discharges, wind-induced currents, as a result of shallow depths existing in the bay, dictate the response of many physical processes within this system. These processes include: (a) hydrodynamic circulation patterns, (b) flooding and drying of marshes, (c) dispersion and deposition of sediments, (d) distribution of fresh and salt water, and (e) dispersion of any pollutants that enter the system. In addition, winds dictate the wave climate in this area. Both short-period, locally generated waves as well as longer period waves, propagating into this region from the Gulf, have the capability to redistribute sediments. There is a definite need to both quantitatively and qualitatively describe the characteristics of the wind fields within this bay system. The role of the wind climatology task in the Atchafalaya Bay investigation is described by McAnally and Heltzel (1978).

2. Most conventional wind analyses rely only on an estimation of statistical parameters to describe the wind fields. These statistical estimates are usually derived from an analysis of a set of prototype wind data, normally speed and direction, under the assumption that all wind conditions belong to one homogeneous population of events. This kind of model can yield very useful information; however, additional insight can be gained by categorizing the circulation patterns associated with daily weather conditions into different synoptic scale events and then examining the wind fields associated with each type of event. In this way, a more homogeneous population of statistical events is assured. Byrne et al. (1977) used this approach in an analysis of the precipitation within this same Atchafalaya Bay system. Wax (1977) studied the variation of water-surface elevations as a function of the sequence of occurrence of different synoptic scale circulation patterns. This study combines

wind-field statistics with information on weather pattern variations in order to form a statistical-climatological model to describe wind conditions within the Atchafalaya Bay area.

3. In addition to a breakdown by synoptic type, the wind analysis is categorized into four seasons. The winter season is chosen to include December through February; the spring season, March through May; the summer season, June through August; and the fall season, September through November. The purpose of this additional discretization is to examine whether or not the frequency of occurrence of each synoptic type and its associated winds changes during a typical year. Evidence of such a seasonal variation was presented in the work by Byrne et al. (1977) and Wax (1977). It is important to note that any seasonal change indicates a climatic variation with a time scale which is larger than that of the synoptic events. The causes of this larger scale of change will not be examined in this study.

PART II: DATA BASE

4. An extensive set of prototype data is required to relate certain sets of wind conditions to particular synoptic scale events within a seasonal framework. A minimum of 1 year of continuous data is essential for this type of study with additional years being optimal. Prior to October of 1981, sporadic wind data were recorded in the Atchafalaya Bay area, primarily for use in testing the weather stations and for use in other aspects of the overall project objectives. Beginning in October 1981 and extending through September 1982, a comprehensive plan to collect wind information within the bay was undertaken.

5. Weather stations were installed at the three locations shown in Figure 1. Exact elevations and locations of the anemometers, in terms of latitude and longitude, are shown in Table 1. Two anemometers were installed at each site, one at approximately a 5-m elevation and the other as close to 10 m as possible. The lower anemometer was installed primarily as a backup for the upper one. These three locations were chosen in order to obtain reasonable spatial coverage of the wind information gathered within the bay. The exact anemometer sites selected were dependent upon the availability of suitable structures upon which the weather stations could be installed. It was anticipated that this configuration could lend insight into the spatial variability of the winds within the bay. However, it also was anticipated that continuous data could not be recorded at all three locations. Therefore a second priority was to record as nearly a continuous record as possible at weather station E, since this station was more or less centrally located.

6. As expected, due to instrument failure, servicing difficulty resulting from logistics problems, and "unkind" weather, continuous data were not recorded at all three locations. Figure 2 shows, in a calendar format, all the data that were collected at each of the six anemometer positions. It should be noted that the secondary objective, continuous data at station E, was essentially met. During the winter and spring seasons, the availability of data was quite good; but for the other two seasons the amount of data taken was considerably less. By using some data taken during the summer of 1981, sufficient records were obtained for both of these seasons as illustrated by the following percentages.

Season	Percentage of Season During Which Usable Data Exist
Winter	96
Spring	92
Summer	52
Fall	69

7. Data taken at each anemometer included wind speed, wind direction, and the standard deviation of direction. All three of these measurements were computed using a 20-min average and were recorded every 20 min. Some of the data taken were not of a usable quality because the anemometers experienced a few mechanical problems during the course of the data-gathering experiment, particularly during electrical storms. Figure 2 also shows the times for which data were recorded but subsequently found to be erroneous. These times are designated by crosshatched areas.

8. Other sources of data were used in the formulation of the statistical-climatological model. In order to determine the long-term wind characteristics of this region, wind data recorded by the National Weather Service at Lake Charles and New Orleans, Louisiana, were used, since many years of data recorded at these two sites are available. Prior to the early 1960's, the locations and elevations of these anemometers changed frequently and it was decided to only use data recorded since that time; the anemometer at Lake Charles remained fixed at an elevation of 22 ft* after May of 1962 and the anemometer at New Orleans remained at 20 ft after December of 1960. These data consisted of measurements of wind speed and direction every 1 or 3 hr and were available from the starting dates listed above through 1975. It was believed that 10 to 15 years of data was sufficient to determine long-term wind characteristics.

9. One other data source was used to illustrate the long-term trends of the wind fields within this area. These data consisted of wind observations reported by ships in the Atchafalaya Bay area and northern Gulf of Mexico adjacent to the bay. More precisely, they included observations within a 1-deg-latitude by 1-deg-longitude block extending from 28 deg north to 29 deg north

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* A table of factors for converting US customary units of measurements to metric (SI) units is presented on page 3.

and from 91 deg west to 92 deg west that were collected during the years 1956 to 1975. These observations were also compiled by the National Weather Service and were used in the study since they were readily available. It is important to note that these measurements, since many were visual observations, are far less accurate than those recorded by anemometers.

10. The final source of data used in this study was the publication "Daily Weather Maps" issued by the Environmental Data and Information Service of the National Oceanic and Atmospheric Administration (US Department of Commerce). This information was used to define the type of synoptic weather pattern causing the circulation of air within the study area on a daily basis. These maps were available for every day during the prototype data collection effort.

PART III: DATA ANALYSIS AND MODEL FORMULATION

11. The first step in the formulation of the statistical-climatological model was to devise a method of categorizing day-to-day circulation into various synoptic scale types based on certain dynamical characteristics particular to each type. The classification criteria that were adopted follow those used by Muller (1977) and Byrne et al. (1977) but with some exceptions. They stratified the weather into eight all-inclusive categories. In this study, two of their types were combined and two others were modified, resulting in a total of seven.

12. Two of the synoptic types deal with the passage of fronts through the area. The first situation, called Frontal Overrunning (FOR), is associated with the passage of a southerly or southeasterly moving cold front. This event usually precedes the west to east progression of a high pressure cell across the continental United States and is characterized by a period of steady winds, usually from southerly directions, that is suddenly interrupted by a rapid increase in wind speed and a switch in direction to winds from the north (Figure 3). Figure 4 shows the time-history of winds encountered during the passage of that cold front over the Atchafalaya Bay.

13. A second synoptic event associated with frontal activity is the Frontal Gulf Return (FGR) situation and is characterized by a northerly moving warm front or by the progression of a weak-to-moderate strength low pressure cell from southern Texas toward the northeast. Steady wind flow prior to the frontal passage is broken by a change in wind direction to winds from southeast through southwest directions. This change in wind direction and speed can often be quite abrupt especially in the case of a low pressure cell passage. An example of a more gentle shift in winds associated with a warm front passage is shown in Figures 5 and 6.

14. Both of these passages also cause noticeable changes in the quality of the air itself. Overrunning of a cold front brings colder, dryer air from the north into the area while a warm front brings with it warmer, moister air from the northern Gulf. The time scales associated with these two phenomena are about the same; each usually lasts between 6 and 24 hr depending upon the forward speed of the front.

15. Another type of circulation that can have high wind conditions with widely changing direction is the infrequent passage of an intense low pressure

center called a Gulf Tropical Depression (GTD). This weather type is comprised of a small low pressure center with tightly spaced isobaric contours and high winds and occasionally affects this area, especially during the late summer months. Hurricanes and intense tropical storms fall into this category. These events are considered separately due to their intensity and infrequent occurrence.

16. The remaining synoptic types are associated with the movement and position of high pressure cells relative to the continental United States and have time scales ranging from hours to days. The first of these types to be considered is called a Continental High (CH) situation. In this study, this type will include both the CH and Pacific High (PH) patterns classified by Byrne et al. (1977). Airflow during these conditions is steady and directed from northwest through northeast directions. Fair, dry, cooler air generally characterizes this circulation which is associated with a clockwise rotation around a high pressure center located over the central and western United States or southern Canada. Figure 7 shows this synoptic pattern, and Figure 8 shows the associated time-history of wind speed and direction measured in the Atchafalaya Bay during this event.

17. A second type, Coastal Return (CR) flow, occurs when these same high pressure systems reach the eastern coast of North America or even move out into the western reaches of the Atlantic Ocean. With this progression, the winds shift from northerly directions to those with primarily eastern components. During winter and spring, this circulation pattern represents colder air modified by short passages over the Atlantic Ocean and northern Gulf as shown in Figure 9. During summer and fall, this includes the Bermuda High situation in which a band of tropical air extends eastward from the southeastern United States far into the Atlantic Ocean; and again, flow is essentially from the east. Figure 10 shows typical wind conditions during a winter coastal return flow of air.

18. When a high pressure system moves still farther eastward out over the Atlantic Ocean, the winds shift from the east to the south resulting in what is called Gulf Return (GR) airflow. These winds bring moist tropical air from the Gulf of Mexico into the area. GR circulation is illustrated in Figure 11 and the accompanying prototype observations are shown in Figure 12. This particular air circulation also can occur after the passage of a warm front or low pressure center once the winds have become fairly steady.

19. The final synoptic scale weather pattern to be considered is the Gulf High (GH) condition in which a high pressure cell is displaced over the northern Gulf. During the eastward passage of this "high," winds are usually rather weak and change in direction from northwest to west to southwest and they bring warmer, dryer air from southern Texas and Mexico. An example of this weather pattern is shown in Figure 13 and the measured winds are shown in Figure 14.

20. Having broken the weather patterns into separate types based on dynamical considerations, the next step was to determine which synoptic pattern was influencing the Atchafalaya Bay area during the times that data were recorded. This was done using daily weather maps in conjunction with measured data. Sudden changes in wind speed and/or direction as well as changes in the standard deviation of wind direction were used to define the transition from one weather type to another. Using all available prototype data, the frequency of occurrence of each synoptic scale type, within the seasonal framework mentioned earlier, was computed. These estimates are shown in Table 2. Results found by Byrne et al. (1977) for New Orleans and Lake Charles can be grouped into this seasonal framework for comparison. Their findings also are shown in Table 2.

21. A few points should be remembered when comparing the results of Bryne et al. (1977) with those of this study. Differences in definitions of the synoptic types (defining the beginning and end of FOR and FGR frontal weather patterns) make comparisons difficult. In addition, the PH circulation type described by Byrne et al. (1977) has been combined with the CH type. Despite these differences, many conclusions about the variation in circulation affecting this area can be formulated and are shown to be substantiated by both sets of results.

22. Winter is dominated by the CH and FOR circulation types which are both characterized by northerly winds. During the 1981-82 winter season, there seemed to be about 10 percent less of these northerly wind conditions than "usual" (49 percent in the Atchafalaya Bay versus 60 percent and 59 percent using the long-term data at Lake Charles and New Orleans). The difference was made up by an increase in CR and GR circulation. Note the sum of the frequencies of FGR and GR for all three data sets. They are nearly identical and indicate that the occurrence of this kind of airflow was about normal for this season. The discrepancies in the individual frequencies of

occurrence of FGR and GR are due to differences in determining the start and end of individual weather patterns.

23. During the spring season, the difference in northerly winds between 1982 and typical years is even more obvious and is again compensated by a large increase in CR circulation and a slight increase in the GR-FGR type of airflow. As with the winter season, the GH and GTD activity during the spring is very small.

24. This trend of decreasing northerly winds continued into the summer of 1982. Once again, the CR circulation has increased as has the airflow into the area from the Gulf. Results during the summer of 1982 may be biased because of the lack of data taken over the entire season. Compared with the long-term results, there seems to be about a 15 percent increase in winds from the south as well as a 5 percent decrease in winds associated with the GH circulation. In addition, GH airflow only becomes important during the summer and the frequency of occurrence of GTD's during this one summer is less than usual.

25. The fall season of 1981-82 was very typical in terms of the distribution of the occurrence of the different synoptic weather patterns. The percentages of CH and FOR wind conditions as well as CR and GR-FGR circulation are almost identical with the percentages found using the results of Byrne et al. (1977). The only major difference is a decrease in the frequency of occurrence of the GTD events.

26. In general, the 1981-82 year in the Atchafalaya Bay area experienced fewer than normal northerly wind conditions. This decrease was accompanied by slight increases in both easterly and southerly winds, and it appears that high pressure systems were able to move across the continent faster. The other major difference, mentioned earlier, is the lack of occurrence of already rare events--the intense tropical storms.

27. Up to this point the "climatological" aspects of the model have been discussed. These include the categorization of weather circulation into separate synoptic types and an analysis of the frequency of occurrence of each type during the year as a whole and during the four seasons that comprise the year. The remainder of the report will deal with wind data that were recorded, manipulation of the data, statistics that were computed, and relations between statistical findings and "climatological" information. One point must be addressed that deals with a key assumption of the model.

28. Due to the size of the Atchafalaya Bay, in relation to the spatial extent of all the synoptic weather types except tropical storms, which will not be discussed very much due to their infrequent occurrence, wind conditions over the entire area were assumed to be relatively constant in terms of both wind speed and direction. Figures 15 and 16, and 17 and 18, show a comparison of the measured wind speeds and directions at weather stations E and B, and E and D, respectively. Winds at each site were recorded on the upper anemometers, which are at elevations within 1 ft of each other. In both instances, wind speeds are within 2 m/sec or 4 knots of each other. Wind directions at E and D are within 20 deg of each other and the direction measurements at E and B are within about 40 deg of each other. There is some evidence that these directional differences may represent a bias. Nevertheless, differences were assumed to be negligible and the supposition of constant wind fields over the entire Atchafalaya Bay was assumed to be true.

29. A vast amount of data was used to generate wind statistics for the Atchafalaya Bay area. Table 3 shows a breakdown, by season, of the number of paired observations of wind speed and direction that were utilized. Statistical information derived from data recorded at Lake Charles, New Orleans, and from ships observations can only be used in a gross sense, such as testing whether or not the distributions of wind speed and direction measured during the 1 year in the Atchafalaya Bay reflect "typical" conditions for this area. Without relating the long-term data directly to the atmospheric circulation on a day-to-day basis, the long-term data can only be used to make inferences about the relations between gross wind statistics measured during 1981-82 and the long term.

30. Before analysis, the data were adjusted to specified formats. Long-term data at the National Weather Service stations were recorded in whole knots and in direction bands for wind speed and direction, respectively. Sixteen bands were used with 22.5 deg in each band. Band number 1, which is centered about 0.0 deg, indicates winds blowing from due north; and increasing bands in the clockwise direction denote increasing wind angles. For example, band number 5 indicates winds blowing from the east at 90 deg and band number 9, winds from the south at 180 deg.

31. Data recorded in the Atchafalaya Bay during 1981-82 were measured in decimal metres per second and decimal degrees. They also were recorded at various elevations dependent upon the anemometer location. Therefore, for

comparison purposes, wind speed data were all converted to a common elevation (10 m) using the following expression given in the Shore Protection Manual (US Army Coastal Engineering Research Center 1977);

$$U_{10} = \left(\frac{10}{Z}\right)^{1/7} U_Z \qquad (1)$$

where U_{10} is the equivalent 10-m wind speed for a measured wind speed, U_Z, recorded at an elevation Z (where Z is in metres). The equivalent 10-m wind speed was then converted to knots. The measured wind directions were assumed to be invariant between the measured elevation and the 10-m elevation and were converted to the 16-band scale mentioned above. In this way, comparisons between statistics computed from the measured data set and the long-term results could be made more easily.

32. The data at Lake Charles were measured at an elevation of 22 ft (6.7 m), and the data at New Orleans, at 20 ft (6.1 m). According to Equation 1, wind speeds at Lake Charles are 6 percent less than their equivalent 10-m values and at New Orleans they are 7 percent less. In the statistical tables for these two sites (Tables 4-11), no compensation for elevation was made in order to avoid difficulties in the presentation of results. However, in the plot comparisons (Figures 19-28), long-term results were properly shifted along the velocity axis. Wind directions at Lake Charles and New Orleans were again assumed not to be a function of elevation. Ships observations, since they had no vertical control, were analyzed and presented as recorded.

33. Tables 4-15 show the bivariate distribution of wind speed and direction, by season at New Orleans, Lake Charles, and Atchafalaya Bay. Figures 19-26 show comparison plots of the one-dimensional frequency of occurrence of both speed and direction, again by season, and include analysis results using ships observations.

34. The frequency of occurrence of wind speeds from all three long-term sources show spikes at multiples of 5 knots. This is obviously due to the fact that a number of recorded observations (such as most of the ships observations) were made by visual inspection or guesswork and not from instrument recordings. For these same ships observations, it is apparent that for wind direction a rougher 8-point scale was utilized most of the time. Therefore results inferred from this particular data source should be used only to

describe generalized trends in the data and not for any detailed analysis.

35. There also appear to be different thresholds for lower values of wind speed recorded at the National Weather Service stations. Nothing less than 1 knot was recorded at New Orleans and nothing less than 2 knots was measured at Lake Charles. These differences, since they occur at the lower end of the wind speed spectrum, are not of great importance. A problem also appears to exist with the anemometers used in the Atchafalaya Bay. They do not seem to be able to differentiate wind directions from about 5 to 10 deg on either side of due north. This is apparent in the data analysis from the lack of observations in direction band 1. This discrepancy must be recognized since it does pose a problem.

36. Referring to the comparison plots, Figures 19 and 20 in particular, it appears that the 1981-82 winter season was quite typical in terms of the wind speeds encountered; however, in terms of direction, there are some differences. There is a decrease in winds from the northernmost directions and an increase in the frequency of winds from the east through the southeast directions. This supports earlier observations concerning the differences in the occurrence of the synoptic weather types between the 1981-82 measurement year and the long-term results.

37. During the spring season of 1982, winds in the Atchafalaya Bay area were not as strong as typically expected except for very large wind speeds, above 20 knots. Again in the wind direction plot, there is a decrease in northerly winds and an increase in easterly winds over "typical" conditions. The large "spike" of winds from the south measured at New Orleans and Lake Charles is not explainable. This also was apparent during the winter season. It might be a remnant of visual observations. Also, note the shift in dominant wind directions from northerly winds to southeasterly winds which again is supported by the findings concerning changes in the frequency of occurrence of the synoptic scale events from winter to spring.

38. During the summer of 1982, wind speeds again seem to be quite normal although their magnitude, in general, has substantially decreased compared with those typical of winter and spring seasons. Winds also are fairly normal in terms of their directional distribution and are shifting from the southeast to the south, which is accompanied by a decrease in winds from the north. Note the effect on wind direction as a result of GH circulation (increased westerly winds).

39. Wind speeds measured during the fall of 1981 and 1982 are slightly larger than those to be normally expected, as indicated by an increase in winds in the 10- to 15-knot range. The distribution of wind direction is very typical for this season which again agrees with the information presented in Table 2. Winds, in general, also are shifting back to northeasterly directions as a result of an increase in CH and FOR circulations.

40. Figures 27 and 28 show the one-dimensional frequency of occurrence of both speed and direction for the entire year in Atchafalaya Bay as well as "average years" in this region, as represented by the cumulative longer term statistics computed from New Orleans and Lake Charles data. Wind speeds measured in the bay during 1981-82 are typical but the distribution of wind direction is slightly different. These cumulative statistics, without regard for synoptic variation, can be very useful in: (a) understanding the overall effects of the seasonal variation in wind conditions, (b) substantiating findings in the Atchafalaya Bay using longer term data, and (c) estimating wind conditions that can be expected in the future.

41. Tables 16-40 contain the bivariate distributions of wind speed and direction, by season and by synoptic weather type, for data recorded in the Atchafalaya Bay during the 1981-82 measurement year. These tables are designed to show wind conditions associated with each of the synoptic circulation patterns defined earlier. They also can be used to examine the seasonal variation of wind conditions for a particular synoptic event. Care must be exercised when applying conclusions drawn from these tables to times other than the measurement year. Caution should be used concerning the frequency of occurrence of that synoptic type during a particular season and how that frequency compares with the expected frequency during the same season in other years. In addition, especially during the summer and spring seasons, it is important to note the number of wind speed-direction pairs that were considered in a particular bivariate distribution. Results presented can be very useful; however, their limitations should be understood. The tables are grouped in the following manner. There are four tables for each synoptic type except the Gulf Tropical Depression (there is only one table). The order of synoptic types is: Continental High, Frontal Overruning, Coastal Return, Gulf Return, Frontal Gulf Return, Gulf High, and Gulf Tropical Depression. Four tables for each type, one for each season, are ordered in this way: winter, spring, summer, and fall.

42. Tables 16-19 are for the CH circulation pattern. During all four seasons this airflow is characterized by potentially high winds out of the northwest through the northeast directions. The highest winds occur during winter and spring and they drop off in magnitude during the summer. During all four seasons, the dominant direction is from the northeast. Tables 20-23 show the bivariate distributions for FOR conditions that are again characterized by high winds which can be quite variable in both speed and direction. Dominant directions also are from the north or northeast and are associated with winds during the latter stages of the frontal passage. Again, like the CH situation, during the summer the magnitudes of the winds during this weather type are smaller.

43. Circulation during the next type considered, the CR flow, is from the northeast through the southeast directions with the dominant direction being from due east. Accompanying this type of weather pattern are winds that are steady in both speed and direction. Winds can be quite large. A decrease in wind magnitude also is apparent during the summer and fall months. The seasonal variation in this synoptic type is shown in Tables 24-27.

44. The GR flow, shown in Tables 28-31, is characterized by steady winds from the east through the southwest directions. In general, wind speeds are less than those found during coastal return airflows. There does not appear to be a decrease in wind speed during the summer for this type, which was the case for previous types.

45. Wind conditions during FGR flow, in Tables 32-35, are characterized by variable winds changing to steady winds blowing from the southeasterly through the southwesterly directions. These steady winds appear to be of low to moderate speeds except during the winter when they can become quite strong. In addition, variable winds often experienced during the initial stages of a warm front passage can be large.

46. GH circulation, shown in Tables 36-39, typically involves a rotation of winds from north to west to the south as the high pressure cell, which is centered in the northern Gulf, migrates eastward. The dominant wind direction is out of the southwest and winds are usually light. As mentioned earlier, this type of circulation only becomes prevalent during the summer months.

47. The remaining circulation pattern is the GTD. Table 40 shows the winds that accompanied the single intense low pressure system which passed

through this general area and was recorded. In this instance, winds were not as variable as they might have been had the center of the system passed directly over the bay. Here winds were predominantly from the south, which indicates passage of the system to the west of the study area. The important feature of this synoptic type is the potentially high winds that can accompany these intense storms.

48. The series of Figures 29-53 are in the same order as the previous series of tables. These plots contain estimates of the duration of wind speed by synoptic type and by season where duration is defined to be the persistence of a certain wind speed once that wind speed has been exceeded. There are two curves on each plot, one for the average duration and one for the maximum duration encountered. The same cautions should be remembered when using these results as were given for the bivariate information. These duration statistics can be very helpful in determining estimates of the average and maximum durations of a particular synoptic type during a certain season as well as the durations of different wind speeds during a particular type of circulation. Figures 54-57 illustrate the duration statistics computed for each season, but in this case all the synoptic weather patterns are combined.

49. The final information presented is a list of wind speed maxima by direction band and by season using the long-term data at New Orleans and Lake Charles (shown in Tables 41-44). Extreme tropical storms have been deleted from this data set; however, this information is useful in determining the expected extreme wind conditions during a year in terms of direction for the other synoptic types. These can be compared with those extremes measured during the data-gathering experiment in the Atchafalaya Bay to determine whether or not typical extreme wind conditions associated with the synoptic weather types were measured. A frequency of occurrence analysis also could be performed on these wind speeds in order to determine future extreme values.

PART IV: SUMMARY

50. Wind data were gathered extensively within the confines of Atchafalaya Bay for a period of 1 year, which started in October 1981 and continued until October 1982. The amount of usable data was extremely large during the winter and spring seasons and sufficient during the summer and fall of 1982. A large amount of data from other sources, namely the National Weather Service stations in Lake Charles and New Orleans and a compilation of observed-from-ships wind conditions in this immediate area, was assembled and analyzed. Statistical estimates were used to express wind conditions in terms of speed and direction. These statistics were then related to the different kinds of weather patterns that influence this region by categorizing these patterns into seven all-inclusive types with each defined by a particular set of dynamical characteristics. In this way, the variations in wind conditions were better related to the climatological forcing that induced these variations.

51. Information was provided on the frequency of occurrence of wind conditions both with and without regard to their causative factors. The latter results were used to substantiate those results found using the statistical-climatological approach. Estimates of the duration of these different weather patterns as well as estimates of the persistence of winds common to each pattern were computed. Finally, information concerning extreme wind conditions that can be expected to occur in any given year was presented using the long-term historical data that were available. Using this information, the variations in the physical processes within the bay that are strongly dependent on the local wind conditions can be better understood and predicted.

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Table 1

Exact Locations and Elevations of the Atchafalaya Bay Anemometers

Station	Elevation ft	Elevation m	Latitude	Longitude
WS-B(U)	29.0	8.85	29°36'N	91°42'W
WS-B(L)	19.0	5.80	29°36'N	91°42'W
WS-D(U)	28.0	8.55	29°27'N	92°25'W
WS-D(L)	16.5	5.05	29°27'N	91°25'W
WS-E(U)	28.5	8.70	29°23'N	91°32'W
WS-E(L)	23.0	7.00	29°23'N	91°32'W

Table 2

Frequency of Occurrence, in percent

by Synoptic Weather Type

Location	Season	PH	CH	FOR	CR	GR	FGR	GH	GTD
Atchafalaya Bay (1981-1982)	Winter		29	20	15	22	9	4	0
	Spring		18	10	22	44	5	1	0
	Summer		7	11	14	39	7	23	0
	Fall		33	22	16	19	3	5	3
	Year		22	16	17	31	6	8	1
Lake Charles (1971-1974)	Winter	11	22	27	10	15	16	0	0
	Spring	9	22	14	10	26	16	2	0
	Summer	0	17	8	11	24	5	32	4
	Fall	7	28	19	15	15	9	2	8
	Year	7	22	16	12	20	11	9	3
New Orleans (1966-1975)	Winter	6	25	28	9	13	17	2	0
	Spring	6	20	15	11	27	18	3	0
	Summer	0	17	6	12	23	8	27	7
	Fall	4	34	15	16	12	10	4	6
	Year	4	25	16	12	18	13	9	3

Table 3

Number of Wind Observations

(Speed and Direction Pairs)

Location	Season				Total
	Winter	Spring	Summer	Fall	
Lake Charles* (1962-1975)	12,391	13,325	13,069	13,237	52,022
New Orleans* (1960-1975)	20,174	20,921	18,671	17,709	77,475
Atchafalaya Bay** (1981-1982)	12,170	11,344	3,847	6,371	33,732
Ship observations	4,438	4,713	5,274	4,708	19,133

* Hourly and 3-hourly observations.

** Twenty-min observations.

Table 4

NEW ORLEANS

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

WINTER SEASON (DEC TO FEB) 20174 HOURLY OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
1	1	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	14
2	34	16	23	30	25	21	10	8	13	14	15	16	23	9	17	17	299
3	49	36	50	61	47	41	22	17	21	23	25	36	36	18	18	34	541
4	66	56	76	91	69	51	38	41	42	37	44	35	50	22	14	49	787
5	83	82	93	104	75	53	47	50	71	55	38	27	44	30	28	45	932
6	102	90	105	119	85	86	65	48	75	44	45	38	39	36	30	47	1061
7	94	97	96	110	73	68	61	61	77	44	34	25	37	37	43	54	1018
8	104	98	99	83	69	51	57	63	83	35	41	33	37	36	45	65	1007
9	85	82	83	67	57	36	45	49	57	28	22	20	20	26	28	54	766
10	122	84	78	65	46	39	46	51	66	27	25	16	32	34	41	95	875
11	82	46	48	41	28	20	23	34	46	17	15	11	22	12	28	57	538
12	104	71	46	40	36	17	29	43	44	24	16	10	20	22	44	81	655
13	82	46	26	21	18	9	21	34	31	13	13	10	15	18	21	46	433
14	50	31	17	12	6	4	12	22	24	14	11	5	11	10	25	39	303
15	53	27	11	10	8	6	9	18	27	12	6	3	7	9	20	35	270
16	34	9	6	5	5	2	6	16	14	9	6	2	4	6	14	22	169
17	21	8	1	3	4	4	2	10	7	6	2	3	5	5	9	12	113
18	20	6	3	3	1	1	0	7	5	9	1	1	4	4	10	12	99
19	5	0	0	1	0	1	0	2	0	1	0	0	1	0	1	4	27
20	7	5	1	0	0	0	1	4	5	1	1	0	2	2	2	6	47
21	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	8
22	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	11
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
25	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	3
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1213	900	874	881	664	521	510	593	722	429	372	304	424	348	451	786	

WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND)
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 6.1 METER ELEVATION.

Table 5

NEW ORLEANS

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SPRING SEASON (MAR TO MAY) 20921 HOURLY OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
2	31	22	16	21	20	9	6	6	12	10	21	26	39	14	17	23	302
3	42	25	40	57	50	32	13	8	21	28	30	40	58	27	28	28	535
4	62	40	46	74	54	59	34	24	39	43	55	54	70	38	24	34	757
5	62	53	56	61	54	81	72	46	62	64	84	40	47	39	29	30	888
6	97	75	52	62	58	92	95	79	82	84	72	39	32	39	27	38	1031
7	82	75	83	54	48	81	102	113	115	75	66	46	26	28	25	44	1069
8	84	73	70	56	44	82	107	123	151	63	55	29	20	25	22	44	1055
9	58	50	43	38	35	54	79	104	119	45	30	16	14	10	15	31	749
10	71	42	50	45	45	68	82	117	149	63	44	21	15	20	27	44	911
11	41	31	30	29	23	27	55	78	116	27	21	14	6	11	11	28	556
12	52	38	34	35	29	32	52	91	120	40	28	14	14	11	18	35	651
13	35	29	22	21	15	26	34	72	86	31	10	11	7	9	19	24	458
14	25	18	19	13	18	14	20	52	63	21	7	9	10	10	15	21	342
15	17	15	14	11	6	7	21	43	48	17	6	8	7	9	16	21	273
16	4	6	4	3	5	3	10	30	35	8	3	4	5	6	9	8	151
17	3	1	0	2	1	1	4	21	21	6	1	3	4	4	7	8	97
18	2	1	1	2	2	1	6	16	12	5	1	2	5	5	1	2	73
19	0	0	0	0	1	1	0	4	10	0	0	0	2	0	0	0	26
20	1	0	0	0	0	1	2	5	8	2	0	0	0	0	1	0	29
21	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	7
22	0	0	0	0	0	0	2	2	2	1	0	0	1	0	0	0	11
23	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	3
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
25	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	4
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	780	602	592	595	519	684	808	1048	1287	645	543	386	394	314	322	474	

WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND)
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 6 1 METER ELEVATION.

Table 6

NEW ORLEANS

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SUMMER SEASON (JUN TO AUG) 18671 HOURLY OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
1	0	1	1	2	1	0	0	0	0	0	1	0	0	0	0	1	9
2	66	40	58	48	48	27	10	13	26	22	32	58	80	59	46	53	693
3	99	56	66	82	72	53	29	18	35	52	91	103	193	109	70	88	1223
4	100	57	80	83	98	80	42	47	86	106	155	141	187	103	68	71	1511
5	111	78	81	71	61	76	86	67	118	145	181	130	130	86	51	71	1552
6	97	86	100	59	53	57	72	101	131	134	144	98	73	64	41	59	1377
7	91	77	87	55	38	45	66	91	119	109	103	68	51	52	27	60	1146
8	69	59	83	50	35	41	57	76	110	78	85	64	40	31	24	45	953
9	30	38	40	26	16	15	23	47	61	40	38	38	25	12	12	30	498
10	25	27	31	26	21	18	29	39	52	28	34	24	18	14	8	13	416
11	11	11	18	19	8	8	9	19	28	17	17	17	11	8	0	5	213
12	8	6	10	10	10	8	11	20	33	9	16	16	7	5	5	2	181
13	3	5	7	6	6	3	6	10	17	5	5	8	3	2	1	1	95
14	2	3	2	5	2	3	3	6	10	3	3	6	5	1	0	0	61
15	0	2	0	2	1	0	2	2	4	2	3	3	0	0	0	0	25
16	0	2	0	0	1	1	1	2	1	1	1	1	0	0	0	0	16
17	1	0	1	0	2	0	0	1	1	0	0	1	0	0	0	0	9
18	0	1	0	0	0	0	0	1	0	0	2	1	0	0	0	0	6
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	0	4
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	719	556	672	551	480	441	454	567	840	758	919	784	831	554	359	507	

WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND)
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 6.1 METER ELEVATION.

Table 7

NEW ORLEANS

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

FALL SEASON (SEP TO NOV) **17709 HOURLY OBSERVATION PAIRS**

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
1	1	1	1	1	1	0	0	0	0	0	0	0	1	3	0	2	16
2	55	32	45	59	44	25	11	9	18	12	19	35	55	31	40	53	550
3	89	55	93	126	89	61	23	15	22	21	33	47	99	41	36	71	930
4	107	79	129	155	90	99	49	27	36	32	36	47	69	45	26	59	1093
5	118	125	172	145	83	98	76	44	53	40	32	25	47	31	29	56	1179
6	130	154	162	126	100	84	80	58	58	40	25	11	26	25	25	47	1158
7	128	132	182	156	83	73	86	63	45	35	19	13	18	28	27	57	1153
8	133	120	177	155	78	60	71	54	36	14	13	12	18	29	25	56	1058
9	93	79	109	88	50	42	39	42	33	11	8	9	10	16	12	28	676
10	95	81	96	97	57	37	37	35	28	3	7	5	8	16	28	37	676
11	48	51	58	52	25	20	21	23	20	7	3	5	4	8	11	18	381
12	70	53	40	45	31	22	19	22	20	6	7	5	12	7	12	35	416
13	52	27	28	23	20	15	5	12	14	3	0	2	3	6	13	23	254
14	23	20	17	20	18	5	4	12	15	5	1	2	5	5	6	19	184
15	28	11	10	13	7	7	5	10	8	2	1	0	2	2	5	16	134
16	9	6	5	2	3	0	1	10	2	0	1	0	0	0	0	6	53
17	1	1	1	4	1	1	1	3	3	0	1	0	0	0	4	5	32
18	2	2	1	2	0	0	2	8	1	0	0	0	0	0	0	3	26
19	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	5
20	1	0	1	0	0	0	0	1	2	0	0	0	0	0	0	0	7
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
22	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
24	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1194	1037	1336	1279	789	656	539	460	425	239	214	227	388	300	308	600	

WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND)
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 6.1 METER ELEVATION.

Table 8

LAKE CHARLES

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

WINTER SEASON (DEC TO FEB) 12391 HOURLY OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
3	24	16	21	14	21	16	18	9	16	10	14	12	8	8	5	8	226
4	68	57	65	85	79	55	59	41	96	37	40	33	30	33	36	38	860
5	93	58	87	117	117	89	87	65	96	45	46	29	37	41	39	46	1095
6	100	58	79	135	102	80	88	70	110	50	40	35	27	33	37	44	1095
7	103	56	79	108	111	106	92	63	86	41	33	21	29	18	33	42	1029
8	98	61	63	100	87	75	92	60	101	42	29	19	15	19	23	41	932
9	71	49	56	86	56	47	53	43	62	22	27	9	10	11	19	37	664
10	109	92	94	94	67	66	85	55	103	44	41	25	13	20	23	54	994
11	64	41	39	67	23	25	47	28	49	24	16	4	6	2	12	29	485
12	107	60	59	61	30	33	49	30	90	29	23	11	12	8	18	38	667
13	93	44	39	46	13	29	34	31	58	18	14	7	8	8	14	40	502
14	79	46	26	24	19	24	21	30	52	14	15	4	7	8	13	33	422
15	83	33	34	16	6	9	24	20	41	13	8	6	8	5	7	36	355
16	42	26	15	12	6	13	14	12	30	8	4	4	2	3	4	16	218
17	29	25	9	8	3	5	8	9	20	5	1	4	0	2	8	19	162
18	22	20	8	4	2	2	5	10	12	2	1	0	0	1	5	10	112
19	3	5	1	2	1	1	4	1	5	1	1	0	1	0	0	4	37
20	16	5	2	4	1	2	2	4	5	2	1	0	0	0	2	6	59
21	4	2	0	0	0	0	0	0	1	0	0	0	0	0	2	1	16
22	6	4	0	2	0	0	2	1	0	0	0	0	0	0	0	4	25
23	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	9
24	0	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	7
25	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	1229	774	787	995	753	689	794	594	1046	418	364	233	219	229	310	557	

WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND)
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 6.7 METER ELEVATION.

Table 9

LAKE CHARLES

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SPRING SEASON (MAR TO MAY) 13325 HOURLY OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	21	16	16	16	24	16	14	11	19	8	17	9	14	9	15	9	240
4	61	36	56	81	60	57	76	57	103	41	40	33	35	27	29	25	824
5	73	44	64	99	99	75	115	99	128	54	57	32	38	29	33	33	1078
6	42	36	53	84	94	72	93	91	144	60	63	21	21	18	26	19	943
7	54	32	51	95	86	59	105	89	165	90	63	25	15	15	19	23	992
8	47	46	42	69	63	52	72	96	182	82	51	15	15	12	23	24	898
9	30	21	20	45	42	36	40	60	152	72	43	21	8	7	14	17	636
10	58	47	48	74	58	48	79	92	249	112	62	15	12	12	18	26	1017
11	30	18	27	29	29	15	29	70	126	60	26	10	4	3	4	14	501
12	41	33	28	38	21	33	45	85	190	90	41	6	5	2	11	18	692
13	33	24	26	30	19	16	45	68	170	75	33	9	3	2	15	15	587
14	24	17	14	18	6	16	28	71	115	55	30	3	3	2	10	12	432
15	19	8	14	19	8	15	27	64	126	60	17	4	3	4	7	18	420
16	12	8	6	12	4	5	12	30	57	34	5	1	3	1	11	9	216
17	11	7	1	6	3	3	12	29	47	28	7	1	0	1	6	6	173
18	6	8	7	5	2	2	15	24	40	10	8	1	0	1	3	6	145
19	0	1	0	2	1	0	3	5	9	3	2	0	0	0	1	0	33
20	1	4	1	0	1	3	10	9	27	8	3	0	0	2	6	3	84
21	0	0	0	0	0	0	1	3	6	2	0	0	0	0	2	0	17
22	0	0	0	0	1	0	3	6	3	0	0	0	0	0	0	0	18
23	0	0	0	1	0	0	2	1	3	1	0	0	0	0	0	0	13
24	0	0	0	0	0	1	0	2	3	0	0	0	0	0	0	0	9
25	0	0	0	0	0	0	0	3	2	1	0	0	0	0	0	0	9
26	0	0	0	0	0	1	1	2	1	0	0	0	0	0	0	0	6
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
28	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	3
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	572	413	482	730	631	532	841	1079	2081	956	574	214	185	157	260	285	

WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND)
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 6.7 METER ELEVATION.

Table 10

LAKE CHARLES

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SUMMER SEASON (JUN TO AUG) 13069 HOURLY OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
3	49	28	34	50	51	24	29	35	52	27	25	28	35	28	33	17	550
4	103	82	133	169	139	117	130	107	188	100	136	104	126	97	80	56	1872
5	75	61	130	179	174	122	162	135	257	122	155	116	100	65	71	39	1970
6	40	45	85	136	110	101	101	74	195	120	127	70	69	59	46	29	1414
7	28	38	65	97	90	67	63	51	169	129	114	56	46	44	26	22	1112
8	28	19	37	68	69	44	37	48	126	107	110	48	41	36	16	16	857
9	16	12	30	42	39	24	29	26	81	82	60	16	19	16	9	3	513
10	13	15	32	35	41	32	32	42	117	140	105	27	22	17	11	7	695
11	6	3	12	10	13	7	9	19	47	74	35	10	5	4	6	3	270
12	6	4	8	9	17	9	14	19	63	84	56	10	3	7	0	2	318
13	3	3	3	1	3	3	11	13	35	43	36	4	2	0	0	1	169
14	0	1	1	2	1	4	7	13	16	23	15	6	0	0	2	0	97
15	0	2	0	1	5	2	4	9	16	16	14	1	0	0	0	0	77
16	0	0	0	0	0	0	1	3	6	10	4	3	0	0	0	0	34
17	0	0	0	0	0	0	0	0	2	3	1	0	0	0	0	0	11
18	0	0	0	0	1	0	1	1	0	2	0	2	0	0	0	0	10
19	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
20	0	1	0	0	0	0	2	2	0	0	0	0	0	0	0	0	10
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	373	321	577	807	762	562	642	605	1379	1094	1001	508	474	378	307	202	

WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND)
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 6.7 METER ELEVATION.

Table 11

LAKE CHARLES

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

FALL SEASON (SEP TO NOV) 13237 HOURLY OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
3	62	33	41	53	37	30	19	15	24	9	7	9	8	19	20	18	410
4	140	95	179	190	154	71	114	71	96	52	42	27	40	39	53	56	1427
5	130	100	172	221	182	115	120	86	111	62	49	33	34	27	52	63	1563
6	94	95	138	191	167	76	120	66	102	50	37	17	16	12	37	45	1269
7	82	91	133	132	129	88	80	56	77	50	38	8	19	9	24	38	1062
8	79	76	104	120	91	76	73	43	75	34	25	15	11	13	18	30	890
9	52	51	71	64	68	64	59	37	43	25	14	6	5	4	8	25	602
10	78	94	112	88	64	71	87	40	68	24	32	6	8	6	16	36	838
11	44	41	42	43	25	27	37	20	21	15	9	6	1	1	10	21	370
12	51	51	65	36	29	40	43	30	28	20	5	2	0	6	13	21	449
13	37	29	30	26	14	15	27	21	27	20	6	3	3	2	15	27	309
14	27	22	20	15	6	14	19	19	31	10	6	4	3	3	6	14	226
15	32	18	14	15	6	10	17	17	15	9	3	1	1	2	6	10	182
16	18	9	3	12	6	6	12	6	13	3	0	0	1	1	5	9	112
17	16	10	7	6	2	12	3	6	12	3	0	0	0	0	1	8	90
18	13	9	6	6	2	6	4	5	10	6	1	0	2	0	2	9	87
19	5	0	0	0	5	3	1	3	1	1	0	0	1	0	0	3	29
20	5	2	1	4	3	0	2	3	5	2	2	0	0	0	0	7	42
21	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	7
22	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	9
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
24	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	3
25	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	4
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	976	837	1146	1233	1001	732	846	556	769	407	290	143	159	153	295	451	

WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND)
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 6.7 METER ELEVATION.

Table 12

ATCHAFALAYA BAY

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

WINTER SEASON (DEC TO FEB) 12170 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	6	8	10	13	19	15	14	13	10	4	9	11	8	4	4	157
1- 2	0	0	0	10	4	7	4	9	4	8	6	3	8	3	1	1	78
2- 3	2	9	12	14	18	12	19	15	9	5	6	6	9	12	12	7	173
3- 4	2	27	23	19	32	36	35	22	12	18	15	9	16	13	19	14	322
4- 5	6	45	46	46	59	50	54	40	42	22	34	20	28	18	35	22	574
5- 6	9	49	71	73	58	73	94	73	41	40	39	21	23	33	39	36	776
6- 7	16	62	77	68	73	111	118	87	58	44	34	26	21	27	38	47	914
7- 8	8	78	94	104	105	121	126	106	50	41	27	32	18	18	46	53	1034
8- 9	5	76	79	115	124	124	131	124	66	29	18	22	16	16	39	72	1064
9-10	4	63	80	105	102	105	87	97	61	18	9	13	15	23	50	67	907
10-11	3	68	55	82	105	78	56	78	63	20	11	9	8	25	40	50	756
11-12	5	63	81	59	59	69	50	67	47	10	11	4	9	19	25	50	637
12-13	1	76	87	60	50	51	50	29	28	5	6	8	10	13	22	45	548
13-14	1	73	64	46	47	42	42	16	16	8	2	7	7	17	32	42	470
14-15	7	65	69	27	48	18	40	6	9	5	5	4	6	13	20	43	393
15-16	5	66	46	15	42	19	12	8	5	5	3	3	9	6	23	50	323
16-17	2	48	30	6	32	15	7	3	2	2	9	3	3	9	23	50	250
17-18	0	42	18	4	14	8	2	4	3	0	1	3	5	16	17	51	196
18-19	1	24	15	3	6	3	4	1	0	3	4	5	5	6	23	38	149
19-20	0	18	8	5	4	3	0	0	0	1	1	0	3	4	16	15	85
20-21	1	11	4	1	3	0	0	0	0	0	0	3	2	11	11	18	70
21-22	3	4	0	0	2	1	0	0	0	0	0	0	2	11	9	18	55
22-23	0	4	2	1	0	0	0	0	0	0	0	0	0	4	2	27	45
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	8
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	4
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	92	989	980	886	1012	977	954	811	537	304	255	219	244	337	557	837	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 13

ATCHAFALAYA BAY

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SPRING SEASON (MAR TO MAY) 11344 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	2	3	5	6	16	26	21	10	18	14	8	6	7	3	5	1	158
1- 2	0	4	11	15	19	17	23	10	7	18	8	8	2	6	4	2	163
2- 3	0	8	16	34	29	30	40	26	24	28	8	12	8	4	6	3	283
3- 4	1	27	45	58	59	55	72	77	44	40	18	10	11	7	9	9	550
4- 5	0	58	66	71	115	97	112	111	63	29	24	22	14	10	14	14	826
5- 6	6	48	62	104	131	133	131	166	79	31	19	28	15	18	13	16	1007
6- 7	10	61	64	132	122	148	154	219	111	29	28	21	9	13	22	13	1163
7- 8	7	44	59	139	111	163	149	224	108	29	21	16	7	8	11	17	1121
8- 9	6	57	51	99	124	162	157	155	51	17	11	13	12	4	8	7	939
9-10	5	46	65	106	99	142	109	94	36	16	3	8	7	5	9	12	770
10-11	7	60	52	71	94	92	83	66	13	6	2	4	2	3	9	14	586
11-12	0	45	55	54	67	92	81	44	9	2	5	2	4	3	11	12	495
12-13	1	60	51	30	31	77	81	29	10	4	1	0	0	3	5	7	398
13-14	2	53	48	32	20	55	70	15	2	0	1	0	0	6	4	14	330
14-15	3	44	38	31	7	37	50	12	0	5	0	0	0	3	10	10	257
15-16	1	48	38	28	5	22	37	12	0	2	2	0	0	4	9	11	229
16-17	0	41	26	10	4	17	37	5	1	0	2	0	0	2	5	4	163
17-18	0	37	21	4	0	7	24	3	2	0	0	0	0	0	6	8	119
18-19	0	23	21	7	0	4	18	0	0	0	0	0	0	0	0	9	88
19-20	0	28	11	6	0	7	28	2	0	0	0	0	0	0	10	12	109
20-21	0	15	6	11	0	6	23	0	0	0	0	0	0	0	14	7	86
21-22	0	15	6	8	0	1	27	5	2	0	0	0	0	0	10	7	86
22-23	0	1	3	9	0	4	9	2	0	0	0	0	0	0	5	3	40
23-24	0	1	3	5	0	0	5	0	0	0	0	0	0	0	1	0	21
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	61	840	833	1081	1062	1408	1554	1298	590	281	171	159	111	111	210	223	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 14

ATCHAFALAYA BAY

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SUMMER SEASON (JUN TO AUG) 3847 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	2	2	15	12	18	12	7	23	25	25	25	31	5	7	2	220
1- 2	0	5	5	10	36	10	18	25	44	20	15	23	23	12	2	2	257
2- 3	0	10	20	31	41	59	38	64	46	20	25	33	51	46	23	2	519
3- 4	0	5	41	54	64	54	62	85	70	70	36	72	88	57	51	23	839
4- 5	0	25	46	67	85	75	96	132	122	83	75	127	85	57	31	54	1167
5- 6	0	41	31	88	101	85	85	181	168	83	127	114	77	67	38	41	1336
6- 7	0	44	28	70	70	80	46	132	168	88	124	90	106	28	59	20	1161
7- 8	5	38	38	49	33	59	116	111	181	72	67	145	132	49	15	41	1161
8- 9	5	36	33	67	33	62	96	119	93	70	59	114	132	44	18	18	1005
9-10	0	5	20	62	25	59	36	59	103	72	57	67	51	38	10	18	691
10-11	0	5	20	28	23	41	36	54	62	41	44	46	25	28	10	5	475
11-12	0	23	23	20	36	7	75	62	62	77	18	10	7	7	0	2	436
12-13	0	0	23	25	25	5	23	33	33	44	18	7	5	5	5	2	259
13-14	0	0	2	12	25	5	33	7	33	46	5	2	5	2	0	0	184
14-15	0	2	0	5	5	2	28	2	2	28	15	2	0	2	0	0	98
15-16	0	0	2	2	0	5	18	0	2	31	2	5	2	0	0	0	72
16-17	0	0	2	2	0	7	5	0	0	25	2	0	2	0	2	0	51
17-18	0	0	5	2	0	0	0	0	2	2	0	0	0	0	2	0	15
18-19	0	5	0	2	0	0	0	0	2	2	0	0	0	5	0	0	18
19-20	0	0	2	0	0	0	0	0	0	0	5	0	0	0	0	0	7
20-21	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	5
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	5
23-24	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
24-25	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	10	252	358	621	626	642	831	1083	1226	909	730	891	831	465	280	236	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 15

ATCHAFALAYA BAY

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

FALL SEASON (SEP TO NOV) 6371 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	1	3	12	14	9	10	17	9	10	14	14	10	10	14	1	4	160
1- 2	1	0	12	10	10	10	14	17	26	18	12	21	18	15	25	1	219
2- 3	0	17	23	39	37	31	34	39	18	15	12	23	32	21	25	12	386
3- 4	1	26	56	58	43	39	40	48	31	25	21	37	42	32	28	14	549
4- 5	6	47	76	53	73	75	50	59	43	20	9	40	37	29	45	17	687
5- 6	0	84	59	48	64	87	78	105	58	42	21	17	18	23	39	31	781
6- 7	3	97	75	54	97	94	106	92	43	18	17	18	25	36	32	50	864
7- 8	3	105	80	92	128	109	130	141	80	31	20	9	23	37	32	28	1054
8- 9	4	62	61	98	134	89	120	123	51	15	9	15	18	32	14	32	888
9-10	3	62	58	134	139	100	103	73	47	12	14	17	17	15	21	20	842
10-11	0	67	81	106	76	73	105	58	12	6	7	6	7	15	18	10	656
11-12	1	67	86	98	65	69	59	36	28	6	6	3	17	15	29	18	610
12-13	6	61	69	81	50	34	48	43	28	4	6	3	7	14	36	26	522
13-14	6	53	31	87	61	28	43	18	26	4	6	4	14	4	54	62	510
14-15	0	64	37	76	39	4	26	10	17	9	0	3	7	9	37	47	392
15-16	1	39	54	54	39	4	10	7	6	10	6	1	1	21	20	45	328
16-17	0	12	29	34	17	1	6	4	9	1	1	0	1	4	9	20	155
17-18	0	15	14	12	3	0	9	9	3	0	0	0	1	4	7	17	98
18-19	0	1	6	7	4	0	1	4	0	3	1	3	0	4	12	32	84
19-20	1	9	1	9	1	1	1	4	3	1	0	0	1	6	18	25	87
20-21	0	10	1	1	0	0	3	1	1	1	0	0	0	3	3	17	45
21-22	0	6	0	0	0	0	0	1	1	0	0	0	0	0	1	10	21
22-23	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	25	26
23-24	0	0	0	0	0	0	1	1	0	0	0	0	0	0	6	4	14
24-25	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
25-26	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
26-27	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	3
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	42	916	932	1180	1101	867	1015	918	554	265	189	238	307	365	524	579	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 16

CONTINENTAL HIGH

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

WINTER SEASON (DEC TO FEB) 3548 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	2	14	14	16	14	14	8	5	5	5	0	2	0	2	11	2	121
1- 2	0	0	2	16	2	5	0	2	2	8	8	2	5	2	2	2	67
2- 3	0	14	25	8	8	2	5	5	0	5	0	8	8	11	25	5	135
3- 4	5	50	36	22	11	0	2	14	5	14	2	5	22	11	31	22	259
4- 5	5	84	81	39	16	2	8	2	5	2	0	11	31	36	73	39	442
5- 6	8	84	152	56	25	14	2	5	2	2	2	5	25	56	87	73	605
6- 7	16	109	157	56	22	5	2	2	5	2	8	11	11	45	62	90	611
7- 8	0	186	256	129	16	2	8	0	2	0	0	2	2	33	78	78	800
8- 9	11	186	211	160	19	5	0	2	2	5	2	0	2	22	84	171	890
9-10	5	146	222	149	28	8	2	0	2	0	2	2	2	22	101	163	862
10-11	2	157	160	118	39	2	2	2	0	11	0	5	8	25	112	84	735
11-12	8	143	231	107	39	11	11	11	2	0	0	2	11	14	62	101	758
12-13	2	180	228	115	25	11	2	5	8	2	5	11	8	0	39	67	715
13-14	2	177	160	84	11	2	5	0	2	2	0	5	5	16	67	50	597
14-15	11	118	186	64	5	5	0	0	5	0	0	0	5	28	33	73	538
15-16	8	107	104	33	5	0	0	0	2	8	0	2	11	16	39	67	408
16-17	5	78	84	11	11	0	5	0	0	2	0	0	0	14	42	101	357
17-18	0	39	45	11	8	2	2	0	0	0	0	0	0	42	31	132	315
18-19	2	22	47	5	0	0	0	0	0	0	5	0	5	16	64	98	270
19-20	0	14	11	5	0	0	0	0	0	5	2	0	2	8	45	39	135
20-21	2	19	2	0	0	0	0	0	0	2	0	8	5	19	28	36	126
21-22	8	5	2	2	0	0	0	0	0	0	0	0	2	19	28	45	115
22-23	0	14	5	5	0	0	0	0	0	0	0	0	0	2	5	62	95
23-24	0	2	0	0	0	0	0	0	0	0	0	0	0	5	0	16	25
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
25-26	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	112	1958	2432	1226	312	98	73	62	59	84	42	90	180	479	1158	1629	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 17

CONTINENTAL HIGH

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SPRING SEASON (MAR TO MAY) 2085 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1- 2	0	4	4	0	0	0	0	0	0	0	0	0	0	0	4	0	14
2- 3	0	9	0	0	0	9	0	0	0	0	0	0	0	0	9	0	28
3- 4	0	23	47	0	4	14	4	0	0	4	0	0	4	9	14	14	143
4- 5	0	124	91	23	19	4	0	4	4	0	0	0	0	9	33	28	345
5- 6	9	105	124	100	52	28	0	0	0	0	0	19	9	62	28	28	570
6- 7	9	167	139	182	81	9	4	0	4	0	4	4	0	52	62	19	743
7- 8	9	115	119	278	57	28	0	0	0	0	14	14	0	23	28	19	709
8- 9	0	220	139	187	115	19	4	4	0	0	4	19	9	4	38	28	796
9-10	14	211	191	254	81	43	9	4	0	4	0	0	4	14	33	47	916
10-11	9	249	163	206	105	67	0	0	4	9	0	0	0	9	52	47	925
11-12	0	148	163	143	38	38	4	0	0	4	0	0	0	4	43	38	628
12-13	9	230	182	38	23	28	4	0	0	0	0	0	0	0	4	19	541
13-14	4	244	211	62	33	14	0	0	0	0	9	4	0	4	0	52	642
14-15	4	182	158	76	14	4	0	0	0	4	0	4	4	0	4	52	513
15-16	0	187	163	38	14	0	0	0	0	9	0	0	4	4	19	28	470
16-17	0	134	76	28	19	0	0	0	4	0	9	0	4	0	28	19	326
17-18	0	158	76	23	4	0	0	4	4	0	0	0	0	4	33	33	345
18-19	0	105	95	33	0	0	0	0	0	0	0	4	0	0	4	52	297
19-20	0	129	62	33	0	0	0	0	0	4	0	0	0	0	57	57	345
20-21	0	62	28	57	0	0	0	0	0	0	0	0	0	0	76	38	263
21-22	0	81	33	43	0	0	0	0	0	0	0	0	0	0	57	38	254
22-23	0	4	14	52	0	0	0	0	0	0	0	0	0	0	23	14	110
23-24	0	4	19	28	0	0	0	0	0	0	0	0	0	0	9	4	67
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	71	2906	2306	1894	666	311	33	19	23	43	43	71	43	206	671	685	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 18

CONTINENTAL HIGH

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SUMMER SEASON (JUN TO AUG) 273 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	0	73	0	0	0	0	0	0	0	0	0	0	0	73
1- 2	0	0	0	0	183	0	0	0	0	0	0	0	0	0	0	0	183
2- 3	0	0	109	183	36	73	0	0	0	0	0	0	0	0	0	0	402
3- 4	0	73	293	219	73	0	0	0	0	0	0	0	0	36	36	36	769
4- 5	0	146	366	439	0	0	0	0	0	0	0	0	0	0	73	36	1062
5- 6	0	146	183	366	183	0	0	0	0	0	0	0	109	219	146	0	1355
6- 7	0	183	183	476	36	0	0	0	0	0	0	183	293	183	109	0	1648
7- 8	0	109	256	146	0	0	0	0	0	0	0	146	256	0	0	0	915
8- 9	0	109	183	329	36	0	0	0	0	0	0	183	256	0	36	0	1135
9-10	0	0	256	219	0	0	0	0	0	0	0	109	73	109	73	0	842
10-11	0	73	219	73	0	0	0	0	0	0	0	36	36	183	73	0	695
11-12	0	109	256	36	0	0	0	0	0	0	0	0	0	36	0	0	439
12-13	0	0	329	0	36	0	0	0	0	0	73	0	0	0	36	0	476
13-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	952	2637	2490	659	73	0	0	0	0	73	659	1025	769	586	73	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 19

CONTINENTAL HIGH

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

FALL SEASON (SEP TO NOV) 2149 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	4	18	9	0	4	9	0	4	4	4	4	0	9	4	4	83
1- 2	0	0	23	23	13	4	0	18	0	13	9	18	23	9	23	0	181
2- 3	0	18	27	51	23	4	0	9	9	4	4	23	32	32	27	9	279
3- 4	0	23	74	102	55	4	0	0	4	4	4	37	55	46	18	0	432
4- 5	0	83	139	65	46	4	0	0	4	0	4	79	23	51	69	9	581
5- 6	0	139	153	69	18	4	0	4	0	0	4	32	13	23	32	32	530
6- 7	0	139	139	51	37	13	0	0	0	0	0	23	9	37	51	93	595
7- 8	0	186	172	69	27	9	0	0	4	0	0	13	27	60	46	51	670
8- 9	13	107	139	74	69	4	4	9	4	4	0	0	23	51	4	46	558
9-10	0	162	158	148	69	0	0	9	0	0	0	0	4	13	27	46	642
10-11	0	144	214	223	37	0	0	0	0	0	0	0	4	13	32	23	693
11-12	0	125	269	172	23	0	0	0	0	0	0	0	0	18	27	46	684
12-13	9	107	218	255	97	0	9	0	0	0	0	4	0	9	32	51	795
13-14	4	125	125	172	116	0	0	0	0	0	0	0	0	0	102	116	763
14-15	0	134	167	246	102	4	0	0	0	4	0	0	4	0	60	69	795
15-16	4	97	162	186	116	13	0	0	0	4	0	0	4	0	37	65	693
16-17	0	32	102	107	32	0	0	0	0	0	0	0	0	0	13	41	330
17-18	0	37	51	46	13	0	0	0	0	0	0	0	0	0	13	18	181
18-19	0	4	18	32	13	0	0	0	0	0	0	0	0	0	18	69	158
19-20	0	18	4	32	4	0	0	0	0	0	0	0	0	0	23	60	144
20-21	0	27	0	4	4	0	0	0	0	0	0	0	0	0	0	46	83
21-22	0	18	0	0	0	0	0	0	0	0	0	0	0	0	0	27	46
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	60	60
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	13
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	32	1740	2382	2145	926	74	23	51	32	41	32	237	228	376	670	1005	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 20

FRONTAL OVERRUNNING

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

WINTER SEASON (DEC TO FEB) 2568 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	7	11	11	11	3	0	19	19	19	11	23	11	7	3	0	163
1- 2	3	0	0	0	3	11	11	3	3	11	15	0	23	7	3	3	105
2- 3	0	7	23	27	19	11	15	11	3	7	19	3	15	31	11	11	221
3- 4	0	50	35	19	54	15	7	11	19	31	15	15	19	11	15	15	338
4- 5	7	62	62	46	54	23	23	7	31	35	27	19	42	19	27	35	525
5- 6	27	109	66	73	23	23	42	38	23	35	54	31	35	23	54	46	708
6- 7	23	85	109	54	31	42	11	27	54	42	42	31	27	27	70	81	763
7- 8	38	120	54	35	11	0	27	35	35	38	35	38	38	27	77	120	735
8- 9	11	97	46	19	7	15	27	35	62	38	15	15	35	46	46	89	611
9-10	15	97	50	19	15	11	7	19	50	42	0	11	42	50	70	93	599
10-11	11	101	35	19	15	7	11	23	23	38	31	31	19	46	11	120	549
11-12	15	101	58	19	7	19	15	38	11	23	35	15	31	31	31	101	556
12-13	3	112	97	27	15	15	31	11	11	11	23	23	38	50	50	120	646
13-14	3	101	77	19	31	38	23	3	19	31	11	27	27	58	62	132	669
14-15	19	147	70	15	19	11	54	7	3	15	27	23	23	23	50	105	619
15-16	15	167	66	19	3	11	19	27	19	15	15	11	27	7	54	144	626
16-17	3	120	19	3	15	15	3	11	7	7	42	15	15	23	54	101	463
17-18	3	147	23	0	0	0	3	19	11	0	7	15	27	19	38	62	381
18-19	3	85	3	0	0	3	15	3	0	15	15	27	19	7	23	46	272
19-20	0	70	0	0	3	0	0	0	0	0	3	3	11	7	15	19	136
20-21	3	27	0	0	0	0	0	0	0	0	0	3	3	27	15	35	116
21-22	3	11	0	0	3	0	0	0	0	0	0	0	7	27	3	27	85
22-23	0	0	3	0	3	0	0	0	0	0	0	0	3	19	3	42	77
23-24	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	3
24-25	0	3	3	0	0	0	0	0	0	0	0	0	0	0	3	7	19
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	218	1838	919	432	354	284	354	358	412	463	451	389	552	603	802	1565	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 21

FRONTAL OVERRUNNING

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SPRING SEASON (MAR TO MAY) 1237 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	8	16	8	8	40	48	24	0	16	32	8	8	24	16	24	8	291
1- 2	8	16	0	56	24	8	48	16	0	24	16	0	0	16	8	8	250
2- 3	0	24	16	80	32	8	32	24	0	8	16	16	24	16	16	16	331
3- 4	8	113	56	88	105	40	40	56	32	16	32	24	32	24	40	32	743
4- 5	0	121	80	64	88	8	32	16	48	24	32	24	40	64	48	72	767
5- 6	40	80	105	72	137	72	24	40	8	8	16	32	80	48	48	97	913
6- 7	64	97	72	105	88	48	48	48	48	16	32	40	32	8	97	88	937
7- 8	48	129	88	80	80	40	40	40	64	48	24	40	40	32	56	129	986
8- 9	56	121	64	80	40	32	8	24	16	0	24	8	32	32	16	16	573
9-10	24	64	97	88	88	48	8	0	0	8	0	16	32	8	24	32	541
10-11	56	88	80	16	40	64	0	24	0	8	8	0	16	16	0	32	452
11-12	8	137	105	64	64	32	8	8	8	0	8	24	0	24	32	48	573
12-13	0	113	121	24	48	32	8	8	24	8	0	8	0	24	40	32	493
13-14	16	64	64	56	16	0	24	8	8	0	0	0	8	48	40	40	396
14-15	16	64	80	64	8	8	0	16	0	24	0	0	0	32	88	8	412
15-16	16	105	72	24	0	0	16	16	8	0	8	0	0	32	56	48	404
16-17	8	121	113	16	8	8	8	0	8	0	0	0	0	24	0	8	323
17-18	0	72	64	0	0	0	0	16	8	0	8	0	8	0	0	24	202
18-19	0	40	32	8	0	8	0	0	8	0	0	0	0	0	0	0	97
19-20	8	40	0	0	0	0	16	0	8	0	0	0	0	0	0	16	88
20-21	0	40	8	8	0	0	8	8	0	8	0	0	0	0	0	0	80
21-22	0	8	0	8	0	0	8	16	8	0	0	0	0	0	0	8	56
22-23	0	8	8	0	0	0	0	8	0	0	0	0	0	0	8	8	40
23-24	0	8	0	0	0	0	0	0	0	0	8	0	8	0	0	0	24
24-25	0	0	0	0	0	0	0	0	0	8	0	0	0	8	0	0	16
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	388	1697	1341	1018	913	509	404	396	323	242	242	242	379	476	646	776	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 22

FRONTAL OVERRUNNING

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SUMMER SEASON (JUN TO AUG) 404 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	24	0	24	49	24	49	24	74	74	49	74	74	49	24	0	618
1- 2	0	24	24	49	49	0	24	0	74	24	24	24	74	0	0	24	420
2- 3	0	49	74	49	49	74	74	148	0	24	24	0	74	74	0	24	742
3- 4	0	0	99	123	74	0	99	99	24	49	99	24	24	24	123	0	866
4- 5	0	74	74	49	173	99	49	49	74	24	0	24	99	74	24	123	1014
5- 6	0	99	99	49	74	74	49	24	49	0	198	49	49	0	49	0	866
6- 7	0	99	74	74	24	123	74	24	49	49	74	49	123	0	99	24	965
7- 8	24	123	99	24	24	24	173	123	49	24	49	24	24	99	24	148	1064
8- 9	0	74	99	24	24	24	49	74	0	49	49	74	49	123	24	74	816
9-10	0	24	24	49	0	0	49	24	24	74	99	148	123	74	24	0	742
10-11	0	0	0	0	0	49	49	49	49	49	24	49	49	74	49	49	544
11-12	0	148	49	0	49	24	49	0	49	198	24	24	0	0	0	0	618
12-13	0	0	0	49	0	24	0	0	0	49	24	0	0	0	0	0	148
13-14	0	0	0	24	24	0	0	0	24	0	24	0	0	24	0	0	123
14-15	0	24	0	24	0	0	24	0	0	0	24	0	0	24	0	0	123
15-16	0	0	0	0	0	0	0	0	24	0	0	0	0	0	0	0	24
16-17	0	0	0	0	0	24	0	0	0	24	0	0	0	0	24	0	74
17-18	0	0	0	24	0	0	0	0	24	24	0	0	0	0	0	0	74
18-19	0	49	0	0	0	0	0	0	24	24	0	0	0	0	0	0	99
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	24	0	24	0	0	0	0	0	0	0	0	0	0	0	49
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	24	816	742	643	643	569	816	643	618	767	792	569	767	643	470	470	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 23

FRONTAL OVERRUNNING

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

FALL SEASON (SEP TO NOV) 1273 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	7	15	39	23	31	47	23	0	31	62	15	23	23	0	15	361
1- 2	7	0	7	23	23	47	7	15	47	0	23	47	15	54	39	7	369
2- 3	0	62	102	94	86	47	70	47	31	54	23	31	70	39	70	31	864
3- 4	7	102	172	125	54	62	39	31	39	15	15	47	62	70	78	47	974
4- 5	31	157	172	70	47	94	7	78	62	15	7	23	86	62	125	62	1107
5- 6	0	235	117	70	54	31	0	39	47	62	31	15	23	39	133	86	989
6- 7	23	267	149	54	70	39	7	15	70	39	7	15	78	70	78	78	1068
7- 8	15	235	157	62	15	23	15	15	39	23	62	23	23	15	47	47	824
8- 9	0	188	78	62	15	7	7	15	15	15	39	23	7	15	23	78	597
9-10	15	62	54	0	39	0	23	15	7	7	31	47	15	23	47	23	416
10-11	0	39	23	23	15	39	15	0	7	0	39	7	0	15	15	15	259
11-12	7	125	15	15	15	23	15	0	15	0	23	7	7	23	31	7	337
12-13	15	109	39	7	7	15	7	7	15	7	15	7	7	0	62	39	369
13-14	23	78	7	23	23	23	15	7	15	7	7	15	15	0	47	102	416
14-15	0	109	7	31	0	0	23	15	23	7	0	15	7	0	31	62	337
15-16	7	47	7	47	31	15	15	0	7	0	23	7	0	7	23	54	298
16-17	0	15	0	31	0	7	0	0	0	0	7	0	0	0	15	7	86
17-18	0	23	0	0	15	0	0	0	0	0	0	0	7	0	7	7	62
18-19	0	0	0	7	7	0	0	0	0	7	0	7	0	7	7	7	54
19-20	7	15	0	7	0	7	0	0	7	0	0	0	7	7	0	7	70
20-21	0	7	7	0	0	0	0	0	0	7	0	0	0	7	15	7	54
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	23
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31	0	31
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0	15
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	164	1893	1146	809	549	518	322	329	455	306	424	361	463	487	934	832	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 24

COASTAL RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

WINTER SEASON (DEC TO FEB) 1721 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	5
1- 2	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	11
2- 3	0	0	0	0	17	11	11	0	0	0	0	0	0	0	0	0	40
3- 4	0	0	0	40	34	46	34	23	0	0	0	0	0	0	0	0	180
4- 5	0	0	17	75	110	122	63	40	46	0	0	0	0	0	0	0	476
5- 6	0	0	52	168	180	151	162	52	40	5	0	0	0	0	0	0	813
6- 7	0	52	29	203	139	273	145	58	11	0	0	0	0	0	0	0	912
7- 8	0	0	29	342	499	354	116	69	5	0	0	0	0	0	0	0	1417
8- 9	0	11	34	342	534	371	156	11	0	0	0	0	0	0	0	0	1464
9-10	0	0	23	325	534	226	139	52	0	0	0	0	0	0	0	0	1301
10-11	0	5	5	267	476	133	69	29	0	0	0	0	0	0	0	0	987
11-12	0	0	0	156	249	168	29	0	0	0	0	0	0	0	0	0	604
12-13	0	0	0	139	151	92	11	0	0	0	0	0	0	0	0	0	395
13-14	0	0	11	98	127	40	11	0	0	0	0	0	0	0	0	0	290
14-15	0	0	5	29	156	11	17	0	0	0	0	0	0	0	0	0	220
15-16	0	0	11	11	226	69	0	0	0	0	0	0	0	0	0	0	319
16-17	0	0	11	17	139	40	0	0	0	0	0	0	0	0	0	0	209
17-18	0	0	5	11	81	40	0	0	0	0	0	0	0	0	0	0	139
18-19	0	0	5	11	34	0	0	0	0	0	0	0	0	0	0	0	52
19-20	0	0	34	29	23	0	0	0	0	0	0	0	0	0	0	0	87
20-21	0	0	23	11	23	0	0	0	0	0	0	0	0	0	0	0	58
21-22	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	11
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	69	302	2289	3759	2155	976	337	104	5	0	0	0	0	0	0	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 25

COASTAL RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SPRING SEASON (MAR TO MAY) 2582 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	7	3	19	11	11	50	11	27	23	15	27	7	11	3	11	3	247
1- 2	0	7	30	15	19	23	19	15	11	34	19	15	7	7	3	0	232
2- 3	0	7	42	50	19	30	42	42	27	46	23	15	15	11	3	0	379
3- 4	0	0	65	116	81	30	73	104	46	69	19	7	7	3	0	0	627
4- 5	0	46	61	92	158	73	104	96	89	46	3	23	23	7	0	0	828
5- 6	0	77	81	170	193	73	69	61	81	58	0	0	11	7	0	3	890
6- 7	7	61	104	305	243	154	96	85	131	34	0	0	3	0	0	0	1231
7- 8	3	23	112	321	255	271	92	65	19	0	0	0	0	0	0	0	1165
8- 9	0	3	69	220	344	321	92	19	11	0	0	0	0	0	0	0	1084
9-10	0	0	65	193	240	213	108	7	0	0	0	0	0	0	0	0	828
10-11	0	7	54	123	220	151	85	0	0	0	0	0	0	0	0	0	642
11-12	0	3	46	81	151	158	100	7	0	0	0	0	0	0	0	0	549
12-13	0	3	7	81	73	158	108	11	0	0	3	0	0	0	0	0	449
13-14	0	0	3	65	34	127	92	0	0	0	0	0	0	0	0	0	325
14-15	0	3	0	46	11	73	23	0	0	3	0	0	0	0	0	0	162
15-16	0	0	3	81	11	54	23	0	0	0	7	0	0	0	0	3	185
16-17	0	0	0	15	0	30	34	0	0	0	3	0	0	0	0	0	85
17-18	0	0	0	0	0	7	15	0	0	0	0	0	0	0	0	0	23
18-19	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	0	19
19-20	0	0	0	0	0	3	27	0	0	0	0	0	0	0	0	0	30
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	19	251	770	1994	2072	2017	1243	546	441	309	108	69	81	42	19	11	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 26

COASTAL RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SUMMER SEASON (JUN TO AUG) 527 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	0	0	56	0	0	18	0	0	0	0	0	0	0	75
1- 2	0	0	0	0	75	37	18	0	0	0	0	0	0	0	0	0	132
2- 3	0	0	0	0	113	151	0	0	0	0	0	18	0	18	0	0	303
3- 4	0	0	18	94	227	208	113	18	37	18	0	0	0	18	0	0	759
4- 5	0	0	37	189	379	189	246	75	94	18	0	0	0	0	0	0	1233
5- 6	0	0	0	360	455	265	322	189	75	18	0	0	18	0	0	18	1726
6- 7	0	0	75	189	360	284	94	75	75	0	0	0	0	0	18	0	1176
7- 8	0	0	56	265	189	208	341	94	18	18	0	0	0	0	0	18	1214
8- 9	0	0	75	284	151	284	189	132	0	0	0	0	18	0	0	0	1138
9-10	0	0	0	303	170	227	18	37	0	0	0	0	0	0	0	0	759
10-11	0	0	18	151	132	56	37	37	0	0	0	0	0	0	0	0	436
11-12	0	0	0	132	189	18	18	0	0	0	0	0	0	0	0	0	360
12-13	0	0	0	151	151	18	0	0	0	0	0	0	0	0	0	0	322
13-14	0	0	0	56	151	18	0	0	0	0	0	0	0	0	0	0	227
14-15	0	0	0	18	37	18	0	0	0	0	0	0	0	0	0	0	75
15-16	0	0	0	18	0	0	0	0	0	0	0	0	0	0	0	0	18
16-17	0	0	0	0	0	37	0	0	0	0	0	0	0	0	0	0	37
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	284	2220	2789	2087	1404	664	322	75	0	18	37	37	18	37	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 27

COASTAL RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

FALL SEASON (SEP TO NOV) 1444 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	6	13	6	13	20	13	13	0	13	6	6	0	0	117
1- 2	0	0	6	0	6	13	34	41	27	0	0	0	0	0	0	0	131
2- 3	0	0	6	27	34	27	62	27	20	0	0	0	0	0	0	0	207
3- 4	0	0	6	34	62	62	76	69	20	13	0	0	0	0	0	0	346
4- 5	0	0	13	110	221	193	124	103	27	6	0	0	0	0	0	0	803
5- 6	0	0	6	90	221	283	159	124	34	0	0	0	0	0	0	0	921
6- 7	0	0	6	145	346	290	186	117	13	0	0	0	0	0	0	0	1108
7- 8	0	0	13	180	533	373	166	110	6	0	0	0	0	0	0	0	1385
8- 9	0	0	13	263	491	353	221	69	0	0	0	0	0	0	0	0	1412
9-10	0	0	20	373	498	367	76	0	0	0	0	0	0	0	0	0	1336
10-11	0	0	0	166	290	221	62	0	0	6	0	0	0	0	0	0	747
11-12	0	0	0	207	242	159	48	6	6	0	0	0	0	0	0	0	671
12-13	0	0	0	90	124	48	13	13	0	0	0	0	0	0	0	0	290
13-14	0	0	0	117	131	62	0	6	0	0	0	0	0	0	0	0	318
14-15	0	0	0	34	62	0	6	0	0	0	0	0	0	0	0	0	103
15-16	0	0	0	6	41	0	0	0	0	0	0	0	0	0	0	0	48
16-17	0	0	0	0	48	0	0	0	0	0	0	0	0	0	0	0	48
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	96	1855	3372	2465	1253	713	173	41	0	13	6	6	0	0	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 28

GULF RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

WINTER SEASON (DEC TO FEB) 2702 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	3	3	7	14	40	37	14	11	7	7	11	25	18	3	3	210
1- 2	0	0	0	11	0	7	0	3	3	0	0	0	0	0	0	0	25
2- 3	0	0	0	18	33	22	18	14	11	3	0	0	0	0	3	0	125
3- 4	0	0	0	0	40	111	77	7	14	0	0	0	0	3	3	3	262
4- 5	0	0	0	7	99	107	140	85	51	7	7	0	0	3	3	3	518
5- 6	0	0	0	3	62	177	218	196	96	33	11	22	3	3	0	3	832
6- 7	0	0	0	14	122	247	381	281	136	77	51	51	7	7	0	3	1384
7- 8	0	0	0	25	103	296	418	325	177	92	70	55	0	3	3	0	1572
8- 9	0	0	0	22	151	247	455	473	218	70	48	29	11	0	0	0	1728
9-10	0	0	0	22	40	203	240	325	203	40	22	22	3	3	0	0	1128
10-11	0	0	0	7	66	166	125	214	236	25	22	3	0	0	0	0	869
11-12	0	0	7	7	25	99	111	177	177	22	18	0	0	0	0	0	647
12-13	0	0	0	3	33	62	125	59	85	11	0	0	0	0	0	0	381
13-14	0	0	0	0	33	22	81	44	25	0	0	0	0	0	0	0	207
14-15	0	0	0	0	22	14	37	3	7	0	0	0	0	0	0	0	85
15-16	0	0	0	0	0	7	3	7	0	0	0	0	0	0	0	0	18
16-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	3	11	151	851	1835	2472	2235	1458	392	259	196	51	44	18	18	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 29

GULF RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SPRING SEASON (MAR TO MAY) 4753 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	6	21	21	31	6	14	8	2	6	2	2	0	0	122
1- 2	0	0	2	10	21	23	25	6	8	6	2	10	2	6	2	2	128
2- 3	0	0	2	18	35	37	56	27	18	21	2	12	4	0	0	2	239
3- 4	0	16	14	27	42	75	107	94	54	25	12	8	2	4	0	2	488
4- 5	0	4	25	63	113	172	189	189	73	31	31	18	4	0	0	0	917
5- 6	0	0	4	71	105	220	262	340	132	37	31	18	6	0	0	0	1232
6- 7	0	0	10	23	79	237	300	448	174	46	54	18	10	6	0	0	1411
7- 8	0	0	0	4	56	212	296	481	225	52	35	23	6	2	0	0	1397
8- 9	0	0	0	0	33	183	321	342	107	42	18	21	16	0	0	0	1087
9-10	0	0	0	0	35	183	195	214	86	35	6	16	8	0	0	0	782
10-11	0	0	0	0	42	84	151	151	29	8	4	10	2	0	0	0	483
11-12	0	0	0	0	44	96	132	98	18	2	8	0	6	0	0	0	408
12-13	0	0	0	0	6	73	130	58	18	6	2	0	0	0	0	0	296
13-14	0	0	0	0	6	56	111	31	4	0	0	0	0	0	0	0	210
14-15	0	0	0	0	2	44	105	25	0	2	0	0	0	0	0	0	178
15-16	0	0	0	0	0	25	73	25	0	2	0	0	0	0	0	0	126
16-17	0	0	0	0	0	23	69	10	0	2	0	0	0	0	0	0	105
17-18	0	0	0	0	0	14	50	2	2	0	0	0	0	0	0	0	69
18-19	0	0	0	0	0	8	33	2	0	0	0	0	0	0	0	0	44
19-20	0	0	0	0	0	14	48	6	0	0	0	0	0	0	0	0	69
20-21	0	0	0	0	0	14	54	0	0	0	0	0	0	0	0	0	69
21-22	0	0	0	0	0	2	63	8	4	0	0	0	0	0	0	0	77
22-23	0	0	0	0	0	10	23	4	0	0	0	0	0	0	0	0	37
23-24	0	0	0	0	0	2	12	0	0	0	0	0	0	0	0	0	14
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	21	58	225	645	1838	2848	2577	974	330	212	166	71	21	2	6	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 30

GULF RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SUMMER SEASON (JUN TO AUG) 1520 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	0	0	0	6	0	13	6	13	6	32	0	0	0	78
1- 2	0	0	0	6	6	0	13	52	46	19	0	13	6	19	0	0	184
2- 3	0	0	0	19	19	39	59	59	59	26	19	13	6	0	6	0	328
3- 4	0	0	0	0	39	59	85	151	105	59	26	46	32	6	6	0	618
4- 5	0	0	0	0	32	85	125	276	210	72	59	19	6	19	0	0	907
5- 6	0	0	0	13	26	92	78	368	348	138	164	39	13	6	6	0	1296
6- 7	0	0	0	6	19	52	46	289	342	138	243	59	46	6	6	0	1256
7- 8	0	0	0	0	6	46	125	184	394	131	125	78	32	0	0	0	1125
8- 9	0	0	0	0	13	46	131	217	217	157	125	59	19	0	13	0	1000
9-10	0	0	0	0	0	59	65	131	250	151	72	26	6	0	0	0	763
10-11	0	0	6	6	13	59	65	111	144	92	78	52	6	6	0	0	644
11-12	0	0	0	0	6	13	157	157	144	144	19	6	6	0	0	0	657
12-13	0	0	0	0	6	0	52	85	85	98	26	6	13	0	0	0	375
13-14	0	0	0	0	0	6	85	19	78	118	6	6	0	0	0	0	322
14-15	0	0	0	0	0	0	65	6	6	72	32	0	0	0	0	0	184
15-16	0	0	0	0	0	13	46	0	0	78	6	0	0	0	0	0	144
16-17	0	0	0	0	0	0	13	0	0	59	6	0	0	0	0	0	78
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	6	0	0	0	0	0	0	0	0	0	6	0	0	13
19-20	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0	13
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	6
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	6	59	190	572	1223	2111	2447	1565	1046	434	230	72	39	0	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 31

GULF RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

FALL SEASON (SEP TO NOV) 1135 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	0	0	0	17	8	0	17	8	0	0	0	0	0	52
1- 2	0	0	0	0	0	0	35	8	8	8	8	0	0	0	0	0	70
2- 3	0	0	0	0	17	52	44	88	35	17	8	0	0	0	0	0	264
3- 4	0	0	0	0	17	61	79	149	88	26	0	0	0	0	0	0	422
4- 5	0	0	0	0	0	52	114	132	158	26	0	0	0	0	0	0	484
5- 6	0	0	0	0	0	88	229	378	273	61	17	0	0	0	0	0	1048
6- 7	0	0	0	0	17	114	325	387	176	44	35	8	0	0	0	0	1110
7- 8	0	0	0	0	0	79	502	651	422	132	26	0	0	0	0	0	1814
8- 9	0	0	0	0	0	35	440	616	308	17	0	8	0	0	0	0	1427
9-10	0	0	0	0	0	52	414	378	193	26	26	0	0	0	0	0	1092
10-11	0	0	0	0	0	52	387	264	8	17	0	0	0	0	0	0	731
11-12	0	0	0	0	0	70	132	123	105	17	0	0	0	0	0	0	449
12-13	0	0	0	0	0	17	158	96	88	17	0	0	8	0	0	0	387
13-14	0	0	0	0	0	0	185	35	70	17	0	8	0	8	0	0	325
14-15	0	0	0	0	0	0	44	0	52	26	0	0	0	0	8	0	132
15-16	0	0	0	0	0	0	17	8	8	44	8	0	0	0	0	0	88
16-17	0	0	0	0	0	0	17	0	44	8	0	0	0	0	8	0	79
17-18	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	8
18-19	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	8
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	52	678	3145	3330	2052	537	140	26	8	8	17	0	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 32

FRONTAL GULF RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

WINTER SEASON (DEC TO FEB) 1148 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	8	17	34	60	34	60	52	34	8	8	34	8	0	8	374
1- 2	0	0	0	8	17	17	8	34	17	26	8	17	17	8	0	0	182
2- 3	0	8	0	26	17	17	52	43	26	17	8	17	26	26	8	0	296
3- 4	8	8	34	26	34	8	78	26	17	43	60	43	17	26	0	0	435
4- 5	0	60	52	113	52	43	34	104	148	87	104	87	78	34	52	0	1054
5- 6	0	17	52	165	60	34	87	78	34	87	113	60	69	34	17	8	923
6- 7	0	43	34	87	139	78	104	34	26	34	17	0	26	52	17	8	705
7- 8	0	0	43	60	60	52	95	95	8	0	0	8	52	26	17	34	557
8- 9	0	0	34	113	78	130	26	87	43	8	8	8	52	0	17	8	618
9-10	0	0	17	78	69	243	121	148	52	0	0	0	52	52	0	0	836
10-11	0	0	0	43	87	174	165	226	60	34	0	0	17	43	0	0	853
11-12	0	0	0	8	60	139	156	174	52	8	0	8	0	8	0	0	618
12-13	0	0	0	8	113	165	148	130	52	0	0	0	0	17	0	0	635
13-14	0	0	0	34	130	226	165	60	60	8	0	0	0	0	0	0	688
14-15	0	0	0	8	165	104	182	43	52	26	0	0	0	0	0	0	583
15-16	0	0	0	0	87	60	78	8	8	0	0	0	0	0	0	0	243
16-17	0	0	0	0	60	69	52	8	8	0	0	0	0	0	0	0	200
17-18	0	0	0	0	8	17	8	0	8	0	0	0	0	0	0	0	43
18-19	0	0	0	0	17	26	8	8	0	0	0	0	0	0	0	0	60
19-20	0	0	0	0	8	34	0	8	0	0	0	0	0	0	0	0	52
20-21	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	8
21-22	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	17
22-23	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	8
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	8	139	278	801	1306	1733	1611	1393	731	418	331	261	444	339	130	69	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 33

FRONTAL GULF RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SPRING SEASON (MAR TO MAY) 495 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	20	0	0	20	20	40	40	60	20	0	20	20	0	0	0	262
1- 2	0	0	40	40	60	40	80	60	0	0	20	20	0	0	20	0	383
2- 3	0	0	40	141	101	121	60	40	101	101	0	20	20	0	20	20	787
3- 4	20	60	181	242	242	222	121	101	101	121	0	0	0	0	0	40	1454
4- 5	0	222	363	262	424	161	121	141	20	60	0	0	0	0	20	40	1838
5- 6	0	40	181	181	424	242	60	121	60	20	0	20	0	0	0	0	1353
6- 7	0	121	60	181	202	161	0	161	60	0	0	0	0	0	0	0	949
7- 8	0	60	20	101	222	80	0	80	60	20	0	0	0	0	0	0	646
8- 9	0	40	60	141	141	121	0	80	40	0	0	0	0	0	0	0	626
9-10	0	20	40	141	121	101	0	40	0	0	20	0	0	40	20	0	545
10-11	0	40	20	80	60	80	20	0	0	0	0	0	0	0	0	40	343
11-12	0	20	0	60	20	121	20	20	20	20	20	0	40	0	0	0	363
12-13	0	20	0	60	60	40	20	20	0	20	0	0	0	20	0	0	262
13-14	0	0	0	0	40	0	0	40	0	0	0	0	0	0	0	0	80
14-15	0	20	0	0	20	0	20	0	0	0	0	0	0	0	0	0	60
15-16	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	20
16-17	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	20
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	20	686	1010	1636	2161	1515	565	969	525	383	60	101	80	60	80	141	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 34

FRONTAL GULF RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SUMMER SEASON (JUN TO AUG) 249 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	40	0	0	40	0	80	80	160	0	80	40	0	40	40	602
1- 2	0	0	0	0	80	80	0	0	0	120	40	40	40	40	40	0	481
2- 3	0	0	0	0	40	40	0	120	281	40	80	120	120	40	40	0	923
3- 4	0	0	0	0	0	0	0	120	200	240	80	40	80	40	120	120	1044
4- 5	0	0	0	0	0	40	80	40	40	160	40	120	200	0	80	40	843
5- 6	0	0	0	40	120	40	40	40	0	200	200	160	80	40	40	40	1044
6- 7	0	0	0	0	120	80	120	40	120	40	0	40	120	0	0	40	722
7- 8	0	40	0	0	0	160	0	200	160	40	0	40	80	40	0	40	803
8- 9	0	0	0	0	40	40	200	120	120	40	0	281	40	0	80	80	1044
9-10	0	0	0	40	40	80	40	0	40	80	80	120	40	80	0	0	642
10-11	0	0	0	0	0	80	0	0	0	0	80	80	120	80	0	0	441
11-12	0	0	0	0	40	0	80	0	0	0	120	80	40	80	0	40	481
12-13	0	0	0	0	0	0	40	0	0	0	0	40	0	0	40	0	120
13-14	0	0	40	40	40	0	0	0	0	0	0	0	80	0	0	0	200
14-15	0	0	0	0	0	0	0	0	0	0	0	40	0	0	0	0	40
15-16	0	0	40	0	0	0	0	0	0	0	0	40	40	0	0	0	120
16-17	0	0	40	40	0	0	0	0	0	0	0	0	40	0	0	0	120
17-18	0	0	80	0	0	0	0	0	0	0	0	0	0	0	40	0	120
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	40	0	0	40
19-20	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	40
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	80	0	0	80
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	40	0	0	0	0	0	0	0	0	0	0	0	0	0	40
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	40	321	160	522	682	602	763	1044	1124	722	1325	1164	562	522	441	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 35

FRONTAL GULF RETURN

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

FALL SEASON (SEP TO NOV) 240 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	0	83	83	0	41	125	41	41	83	41	41	0	0	583
1- 2	0	0	0	0	41	0	0	0	83	41	41	41	41	41	41	0	375
2- 3	0	0	0	83	83	125	0	166	41	41	125	41	0	41	41	41	833
3- 4	0	0	0	41	83	83	83	0	125	0	166	41	41	0	83	125	875
4- 5	0	0	0	0	83	250	83	125	83	125	166	125	0	0	0	41	1083
5- 6	0	0	0	0	41	125	208	0	41	41	208	125	41	41	0	41	916
6- 7	0	0	41	41	83	208	250	83	0	0	41	41	41	83	0	0	916
7- 8	0	0	0	541	166	291	125	0	0	0	0	0	0	0	41	0	1166
8- 9	0	0	0	208	333	250	0	0	0	0	0	0	41	41	41	41	958
9-10	0	0	0	291	125	375	83	0	0	0	0	0	0	41	0	0	916
10-11	0	0	0	41	83	83	125	41	0	0	0	0	0	0	0	0	375
11-12	0	0	0	0	0	83	0	41	0	0	0	0	0	0	83	0	208
12-13	0	0	0	0	125	125	83	0	0	0	0	0	0	0	0	0	333
13-14	0	0	0	41	41	0	0	0	0	0	0	0	0	0	0	41	125
14-15	0	0	0	0	125	41	41	0	0	41	0	0	41	0	0	0	291
15-16	0	0	0	0	0	41	0	0	0	0	0	0	0	0	0	0	41
16-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	41	1291	1500	2166	1083	500	500	333	791	500	291	333	333	333	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 36

GULF HIGH

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

WINTER SEASON (DEC TO FEB) 504 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	0	0	0	19	0	19	0	0	0	19	39	0	39	138
1- 2	0	19	0	39	0	0	39	99	19	39	0	19	0	0	0	0	277
2- 3	59	59	0	0	0	19	99	99	79	0	39	39	19	0	19	79	615
3- 4	0	39	59	19	19	39	79	198	39	99	158	19	99	99	178	99	1250
4- 5	79	39	39	59	0	0	79	79	59	99	416	138	79	0	119	59	1349
5- 6	19	0	19	19	19	0	119	119	119	376	357	79	19	198	59	79	1607
6- 7	158	19	19	0	0	0	0	178	257	337	277	198	218	59	138	59	1924
7- 8	0	0	0	0	0	0	0	198	19	317	158	317	99	0	138	39	1289
8- 9	0	0	0	0	0	0	0	39	0	79	79	317	19	0	79	59	674
9-10	0	0	0	0	0	0	0	0	0	0	79	178	0	0	158	0	416
10-11	0	0	0	0	0	0	0	0	0	0	0	0	0	99	119	0	218
11-12	0	0	0	0	0	0	0	0	0	0	0	0	0	198	19	0	218
12-13	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0	19
13-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	317	178	138	138	39	59	436	1011	615	1349	1567	1309	575	714	1031	515	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 37

GULF HIGH

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SPRING SEASON (MAR TO MAY) 194 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	0	0	0	51	0	154	154	51	0	51	0	0	0	463
1- 2	0	0	51	0	51	0	0	0	51	309	51	0	0	0	0	51	567
2- 3	0	154	154	0	103	0	51	51	360	206	51	51	0	0	51	0	1237
3- 4	0	51	103	0	51	0	0	206	154	360	309	154	257	0	154	51	1855
4- 5	0	0	0	51	0	0	51	51	309	51	412	360	154	0	103	0	1546
5- 6	0	51	0	103	0	0	0	0	103	51	257	721	0	0	154	0	1443
6- 7	0	51	51	0	0	0	0	0	0	51	51	463	51	0	0	0	721
7- 8	0	51	51	0	0	0	0	0	0	51	51	0	51	0	0	0	257
8- 9	0	51	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51
9-10	0	51	154	0	0	0	0	0	0	0	0	0	0	0	0	0	206
10-11	0	103	51	0	0	0	0	0	0	0	0	0	0	0	0	0	154
11-12	0	103	206	0	0	0	0	0	0	0	0	0	0	0	0	0	309
12-13	0	257	154	0	0	0	0	0	0	0	0	0	0	0	0	0	412
13-14	0	103	103	0	0	0	0	0	0	0	0	0	0	0	0	0	206
14-15	51	103	51	0	0	0	0	0	0	0	0	0	0	0	0	0	206
15-16	0	154	0	0	0	0	0	0	0	0	0	0	0	0	0	0	154
16-17	0	206	0	0	0	0	0	0	0	0	0	0	0	0	0	0	206
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	51	1494	1134	154	206	0	154	309	1134	1237	1237	1752	567	0	463	103	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 38

GULF HIGH

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

SUMMER SEASON (JUN TO AUG) 876 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	57	11	22	22	0	11	22	68	45	34	0	11	0	308
1- 2	0	11	11	11	0	0	34	22	79	11	45	57	45	11	0	0	342
2- 3	0	22	22	22	34	34	34	79	22	22	45	79	148	148	79	0	799
3- 4	0	0	34	57	22	11	0	11	34	91	45	216	296	194	114	57	1187
4- 5	0	34	34	22	11	11	11	22	68	171	216	479	262	182	79	159	1769
5- 6	0	91	34	0	11	11	11	22	68	57	125	365	228	205	79	159	1472
6- 7	0	91	0	0	0	11	0	11	45	114	91	205	205	57	159	68	1061
7- 8	11	68	11	11	11	0	11	0	34	57	57	433	410	159	57	91	1426
8- 9	22	91	0	11	0	0	0	0	0	0	22	228	422	136	11	22	970
9-10	0	11	0	0	0	0	0	0	0	0	57	114	125	79	11	79	479
10-11	0	0	0	0	0	0	0	0	0	0	22	57	34	0	0	0	114
11-12	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	11
12-13	0	0	0	0	0	0	0	0	0	0	0	11	0	22	0	11	45
13-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-16	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	11
16-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	34	422	148	194	102	102	125	171	365	547	799	2305	2226	1198	605	650	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 39

GULF HIGH

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

FALL SEASON (SEP TO NOV) 341 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	58	29	0	0	29	0	58	0	58	29	175	175	0	0	615
1- 2	0	0	29	0	0	0	0	0	117	205	58	117	146	87	175	0	938
2- 3	0	0	0	0	0	0	0	0	0	87	87	234	322	117	58	87	997
3- 4	0	0	0	0	0	0	0	0	29	293	205	381	293	175	146	0	1524
4- 5	0	0	0	0	0	0	0	0	29	175	29	146	293	0	29	0	703
5- 6	0	0	0	0	0	0	0	0	0	351	87	0	117	29	29	87	703
6- 7	0	0	0	0	0	0	0	0	146	58	146	117	146	58	87	87	850
7- 8	0	0	0	0	0	0	0	0	117	117	58	29	87	58	146	29	645
8- 9	0	0	0	0	0	0	0	0	0	87	29	175	146	29	117	0	586
9-10	0	0	0	0	0	0	0	0	117	87	29	146	58	58	0	0	498
10-11	0	117	175	29	29	29	0	0	58	58	0	87	0	58	0	0	645
11-12	0	87	58	29	0	58	0	29	0	58	0	0	58	0	0	0	381
12-13	0	146	0	0	29	29	29	87	29	29	29	0	0	58	0	29	498
13-14	0	0	0	29	29	29	58	0	0	0	58	0	58	0	0	58	322
14-15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	87	87
15-16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16-17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17-18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18-19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19-20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20-21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22-23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23-24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25-26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28-29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	351	322	117	87	146	117	117	703	1612	879	1466	1906	909	791	469	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 40

GULF TROPICAL DEPRESSION

BIVARIATE DISTRIBUTION OF WIND SPEED AND DIRECTION
(IN PERCENT OCCURRENCE X100)

FALL SEASON (SEP TO NOV) 267 20 MIN OBSERVATION PAIRS

WIND SPEED (KNOTS)	DIRECTION BAND 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	TOTAL
0- 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1- 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2- 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3- 4	0	0	0	0	0	0	0	37	37	0	0	0	0	0	0	0	74
4- 5	0	0	0	0	0	0	0	37	37	0	0	0	0	0	0	0	74
5- 6	0	0	0	0	0	0	0	149	112	0	0	0	0	0	0	0	262
6- 7	0	0	0	0	0	0	0	74	74	0	0	0	0	0	0	0	149
7- 8	0	0	0	0	0	0	0	224	374	37	0	0	0	0	0	0	636
8- 9	0	0	0	0	0	0	74	224	187	112	74	0	0	0	0	0	674
9-10	0	0	0	0	0	149	112	224	187	37	37	0	0	0	0	0	749
10-11	0	0	0	0	37	74	262	187	224	0	37	37	0	0	0	0	861
11-12	0	0	0	0	0	112	262	449	262	0	0	0	0	0	0	0	1086
12-13	0	0	0	0	0	74	337	374	224	74	37	0	0	0	0	0	1123
13-14	0	0	0	0	0	112	112	449	224	0	37	0	0	0	0	0	936
14-15	0	0	0	0	0	0	299	299	74	37	37	37	0	0	0	0	786
15-16	0	0	0	0	0	0	149	187	112	37	0	0	0	0	0	0	486
16-17	0	0	0	0	0	0	74	224	74	0	0	0	0	0	0	0	374
17-18	0	0	0	0	0	0	224	262	37	0	0	0	0	0	0	0	524
18-19	0	0	0	0	0	0	37	187	37	0	37	37	0	0	0	0	337
19-20	0	0	0	0	0	0	37	149	37	37	0	0	0	0	0	0	262
20-21	0	0	0	0	0	0	74	37	74	0	0	0	0	0	0	0	187
21-22	0	0	0	0	0	0	0	37	37	0	0	0	0	0	0	0	74
22-23	0	0	0	0	0	0	0	37	0	0	0	0	0	0	0	0	37
23-24	0	0	0	0	0	0	37	37	37	37	0	0	0	0	0	0	149
24-25	0	0	0	0	0	0	0	0	37	0	0	0	0	0	0	0	37
25-26	0	0	0	0	0	0	0	0	37	0	0	0	0	0	0	0	37
26-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27-28	0	0	0	0	0	0	0	37	0	0	0	0	0	0	0	0	37
28-29	0	0	0	0	0	0	0	37	0	0	0	0	0	0	0	0	37
29-30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
31-32	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
32-33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34-35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
36-37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37-38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
39-40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	0	0	0	37	524	2097	3970	2546	411	299	112	0	0	0	0	

THE WIND DIRECTION IS DIVIDED INTO 16 BANDS(22.5 DEGREES IN EACH BAND).
BAND 1 IS CENTERED ABOUT 0.0 DEGREES AND INDICATES WINDS BLOWING FROM THE NORTH.
INCREASING BAND NUMBERS REFLECT INCREASING WIND ANGLES(MEASURED CLOCKWISE).

THE WIND SPEED IS THAT MEASURED AT A 10 METER ELEVATION.

Table 41

Maximum Winter Wind Speeds, knots,

at New Orleans and Lake Charles

Year	Direction Band 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
New Orleans																
1961	18	16	17	19	16	19	13	18	20	25	17	14	20	22	18	19
1962	23	20	16	18	18	13	16	18	22	25	18	18	20	13	19	20
1963	24	22	20	24	17	12	14	16	19	20	17	11	12	18	17	24
1964	19	17	22	17	18	13	16	20	20	20	25	26	22	16	17	17
1965	21	15	17	15	17	13	23	19	24	15	14	20	23	16	14	18
1966	16	17	19	17	16	18	24	19	22	30	10	16	19	14	23	16
1967	17	15	12	16	13	12	13	14	18	18	17	17	12	13	16	22
1968	19	17	18	15	15	14	16	22	18	18	20	17	20	20	21	19
1969	20	16	16	24	25	24	17	21	17	16	16	18	19	16	20	18
1970	18	14	18	16	15	15	17	16	18	14	14	17	15	14	18	20
1971	17	17	20	19	16	12	17	30	24	19	16	10	16	14	20	16
1972	21	15	16	11	13	14	20	16	16	21	14	5	7	9	18	19
1973	20	17	16	14	15	17	20	29	17	15	14	11	18	27	18	18
1974	18	15	11	14	13	16	21	24	17	22	16	15	20	21	17	16
1975	19	16	14	13	15	17	15	17	20	16	19	15	18	17	16	22
Lake Charles																
1963	28	27	22	23	16	17	18	22	20	22	19	16	15	12	15	18
1964	20	20	21	22	17	16	18	16	19	20	22	18	19	18	18	21
1965	17	17	16	17	16	16	18	18	24	16	14	17	15	14	21	18
1966	22	16	16	16	20	17	22	24	24	13	10	11	8	16	18	20
1967	20	18	18	13	11	14	16	15	16	17	14	12	15	12	14	17
1968	20	20	16	17	14	16	16	18	20	14	13	8	10	15	17	22
1969	18	15	15	15	19	16	15	19	17	17	13	15	15	17	19	19
1970	22	15	16	17	18	20	19	13	19	17	20	26	12	14	17	26
1971	20	17	19	21	19	26	18	20	23	20	18	14	16	19	20	22
1972	20	21	20	22	11	16	18	16	19	17	10	12	10	9	18	18
1973	20	22	17	16	14	21	22	24	25	15	19	20	16	16	21	22
1974	20	16	14	14	20	20	19	26	17	17	16	15	27	30	14	18
1975	24	18	18	16	24	19	28	22	27	15	13	16	16	17	21	22

Table 42

Maximum Spring Wind Speeds, knots,

at New Orleans and Lake Charles

Year	Direction Band 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
New Orleans																
1961	20	17	19	18	18	17	15	25	18	17	15	18	19	22	21	17
1962	15	15	17	15	18	15	18	22	18	18	14	20	14	18	19	18
1963	18	18	16	15	15	17	16	18	22	25	18	15	18	16	18	16
1964	16	16	14	14	19	20	18	22	25	25	26	17	19	15	18	16
1965	15	16	15	14	13	15	16	17	18	20	12	14	20	14	16	15
1966	18	14	20	17	20	15	17	20	18	21	15	16	22	15	17	16
1967	16	16	16	15	19	16	24	20	20	16	13	11	22	17	19	17
1968	18	14	14	15	16	18	22	20	23	17	14	19	22	17	17	17
1969	17	17	18	20	18	18	26	29	32	14	17	19	18	15	17	17
1970	14	16	16	15	15	17	20	17	28	15	18	12	15	12	15	17
1971	18	19	12	16	12	14	16	20	24	14	14	17	14	14	16	21
1972	20	18	16	15	15	18	22	16	20	14	17	14	14	11	12	21
1973	16	15	13	12	17	27	27	28	23	18	16	17	18	16	25	17
1974	15	19	15	14	18	19	18	20	22	16	18	15	17	16	20	16
1975	19	15	15	16	19	20	16	18	23	17	16	17	24	15	16	18
Lake Charles																
1963	18	20	18	18	14	14	20	22	24	22	18	15	11	12	24	20
1964	18	20	18	18	19	16	18	20	26	25	24	16	19	20	23	20
1965	18	18	20	13	18	16	17	19	22	15	15	10	10	10	18	18
1966	18	17	18	18	16	15	18	19	20	19	20	15	9	21	21	16
1967	18	25	18	17	15	16	19	23	20	16	11	9	7	7	16	16
1968	18	15	14	15	13	12	18	18	23	16	13	13	15	20	21	14
1969	18	15	18	18	17	26	20	18	28	16	14	17	13	13	20	17
1970	15	17	15	19	12	20	15	21	24	16	13	18	15	14	18	15
1971	22	20	18	17	15	15	18	18	22	17	19	9	16	22	21	23
1972	17	13	23	23	22	15	18	18	20	19	15	10	12	18	16	15
1973	20	20	24	25	22	24	32	28	27	18	18	18	16	17	20	27
1974	17	18	14	19	16	16	23	28	25	18	15	12	15	5	16	20
1975	17	13	15	19	16	26	25	26	26	14	14	12	16	20	17	22

Table 43

Maximum Summer Wind Speeds, knots,

at New Orleans and Lake Charles

Year	Direction Band 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
New Orleans																
1961	12	10	13	14	20	12	15	16	13	15	16	18	20	14	10	13
1962	10	16	18	15	13	13	15	15	14	20	19	14	12	13	10	11
1963	16	15	14	14	15	11	11	13	12	15	18	20	12	11	12	10
1964	11	16	11	11	13	12	16	12	12	13	18	20	18	12	11	13
1965	10	9	14	12	14	14	13	15	14	12	23	11	11	14	13	11
1966	12	16	17	15	17	14	13	14	11	16	11	15	11	10	12	9
1967	13	16	13	14	13	16	11	15	20	11	14	12	13	12	10	13
1968	12	12	13	17	20	16	14	16	15	12	13	13	16	11	7	12
1969	24	18	15	13	16	12	14	14	14	14	18	12	24	16	12	30
1970	13	18	12	14	11	14	13	15	17	8	18	14	14	10	14	9
1971	17	10	11	13	8	9	13	23	12	11	10	12	14	10	12	21
1972	17	13	13	15	17	16	15	16	13	15	18	17	14	13	12	10
1973	13	14	13	14	12	21	14	12	15	11	13	13	14	11	13	11
1974	14	18	14	11	13	11	13	17	20	14	9	17	13	12	10	11
1975	11	8	11	9	17	11	13	16	16	14	14	12	13	10	12	10
Lake Charles																
1963	11	13	17	23	18	12	20	19	13	19	17	16	10	12	11	16
1964	13	20	12	15	17	16	18	25	15	16	16	18	12	12	11	11
1965	14	9	11	13	18	28	18	14	16	14	16	14	14	13	13	12
1966	10	10	10	11	12	12	13	13	13	13	15	14	15	7	10	10
1967	13	14	12	14	14	9	12	11	12	14	14	12	11	7	9	7
1968	8	9	13	20	10	8	12	12	15	12	13	11	8	8	5	10
1969	13	15	10	12	15	13	12	15	15	16	13	14	11	11	11	10
1970	11	11	9	10	12	10	14	16	16	14	10	12	11	8	12	8
1971	20	10	14	11	15	15	13	12	16	14	10	12	11	8	12	8
1972	12	12	12	13	16	14	22	14	17	16	17	16	17	11	14	11
1973	12	12	12	12	12	12	15	16	16	15	13	11	12	12	14	12
1974	12	16	16	12	15	13	20	33	22	22	12	18	12	10	16	11
1975	20	18	16	18	12	14	18	22	14	11	9	5	7	12	17	23

Table 44

Maximum Fall Wind Speeds, knots,

at New Orleans and Lake Charles

Year	Direction Band 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
New Orleans																
1961	15	18	18	20	16	15	23	22	17	10	9	12	13	11	17	16
1962	15	16	15	15	16	10	12	15	19	14	12	12	15	15	15	17
1963	16	24	20	16	20	17	15	22	14	12	10	14	17	13	17	18
1964	20	14	14	17	17	12	13	17	15	15	10	8	10	13	14	13
1965	15	15	14	14	13	10	6	6	16	17	15	11	12	10	13	13
1966	15	16	13	13	15	15	10	11	12	14	8	9	12	14	22	21
1967	15	14	15	15	15	16	18	16	14	15	17	14	20	14	14	16
1968	23	18	20	17	18	15	14	18	21	15	16	25	19	15	17	17
1969	18	19	15	15	16	13	18	15	14	13	10	8	10	15	17	18
1970	18	15	15	12	17	15	16	17	20	9	12	12	16	13	13	18
1971	16	16	14	15	13	13	12	13	9	16	9	5	8	11	11	13
1972	17	15	15	21	15	17	16	24	24	7	13	13	15	14	15	14
1973	15	17	15	17	17	15	17	18	24	18	14	10	18	14	13	17
1974	16	14	16	15	16	13	15	14	16	8	11	8	11	15	17	14
1975	21	23	15	12	13	15	12	19	17	13	16	6	10	13	17	17
Lake Charles																
1963	18	25	18	23	24	18	17	21	18	20	14	11	8	11	13	20
1964	19	18	20	18	15	12	15	15	20	18	13	10	14	8	15	13
1965	13	14	13	11	12	13	14	13	11	15	15	14	9	5	13	16
1966																
1967	17	16	12	18	16	16	13	15	18	14	14	16	14	16	16	14
1968	16	14	17	17	8	17	20	17	21	14	12	13	18	15	18	18
1969	17	13	15	13	16	15	16	17	17	10	14	13	7	13	11	18
1970	23	22	18	17	20	19	19	21	23	15	16	10	9	12	17	18
1971	19	20	17	16	16	14	14	15	16	18	15	6	9	8	10	16
1972	16	14	14	17	16	18	15	15	18	13	11	8	10	12	14	15
1973	14	17	18	20	25	17	16	18	20	13	13	8	15	16	16	20
1974	18	17	14	14	12	19	16	19	17	10	13	6	14	10	15	18
1975	20	18	16	18	12	14	18	22	14	11	9	5	7	12	16	23

FIGURES

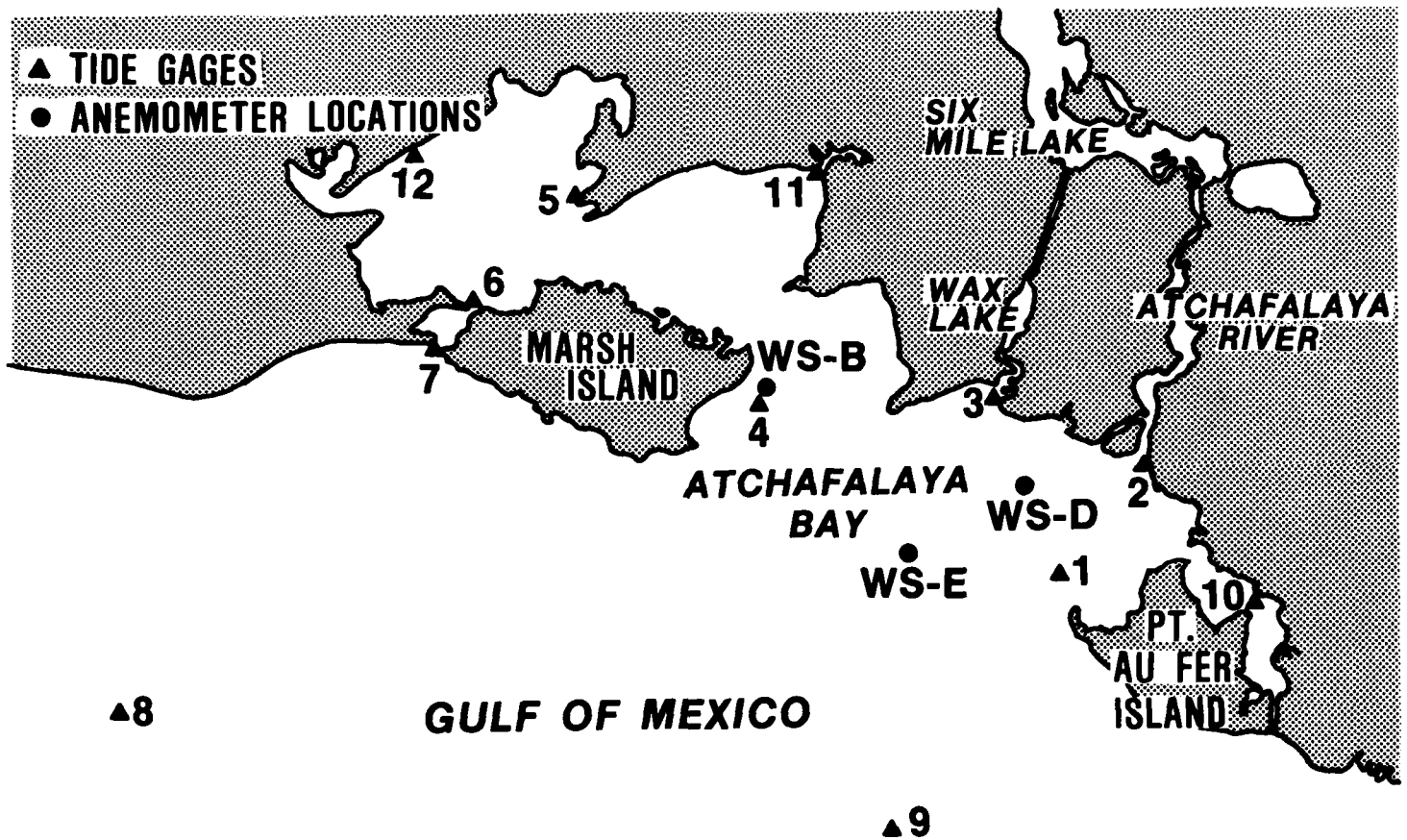

Figure 1. Location of weather stations (WS) in the Atchafalaya Bay

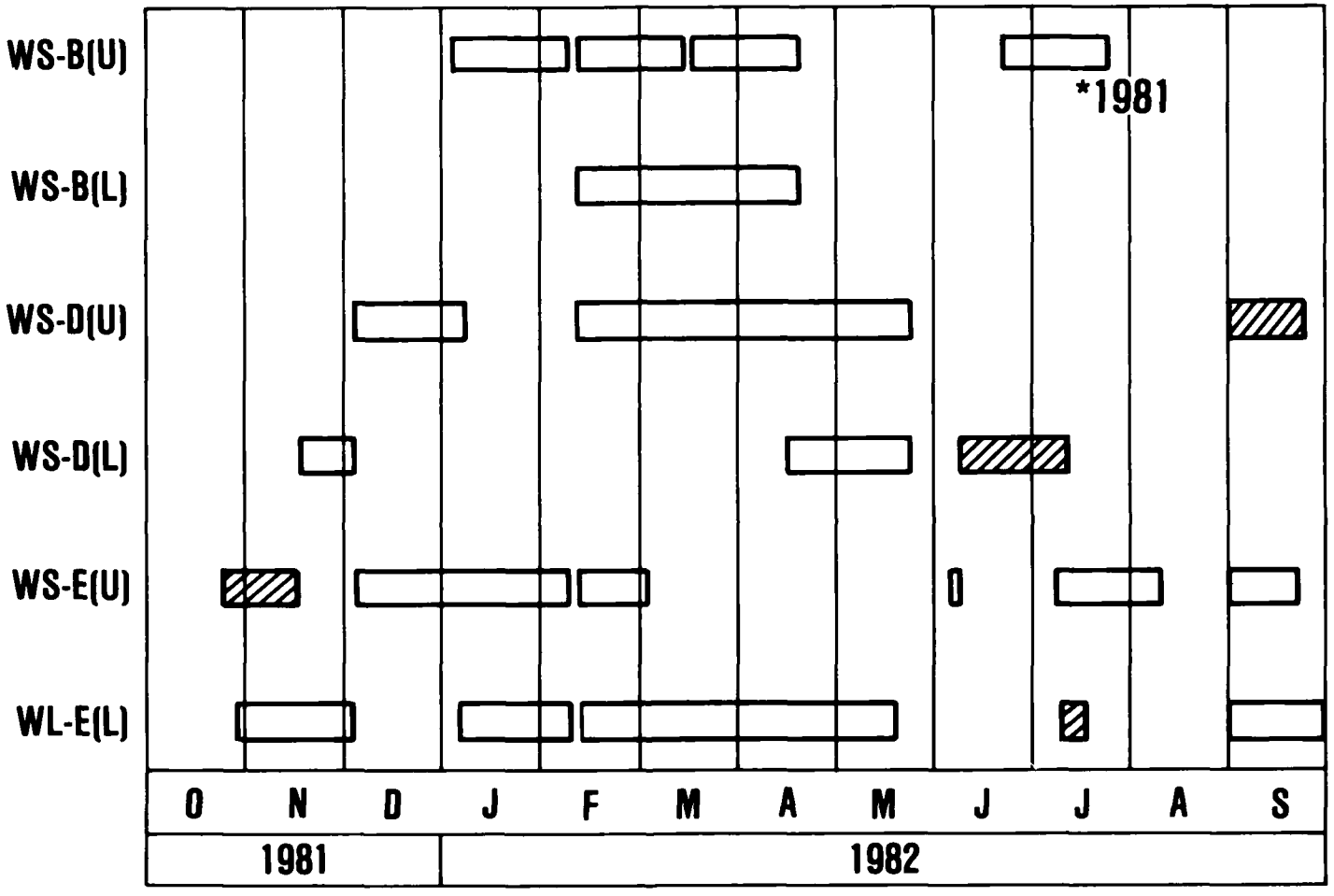

Figure 2. Prototype data collected in the Atchafalaya Bay

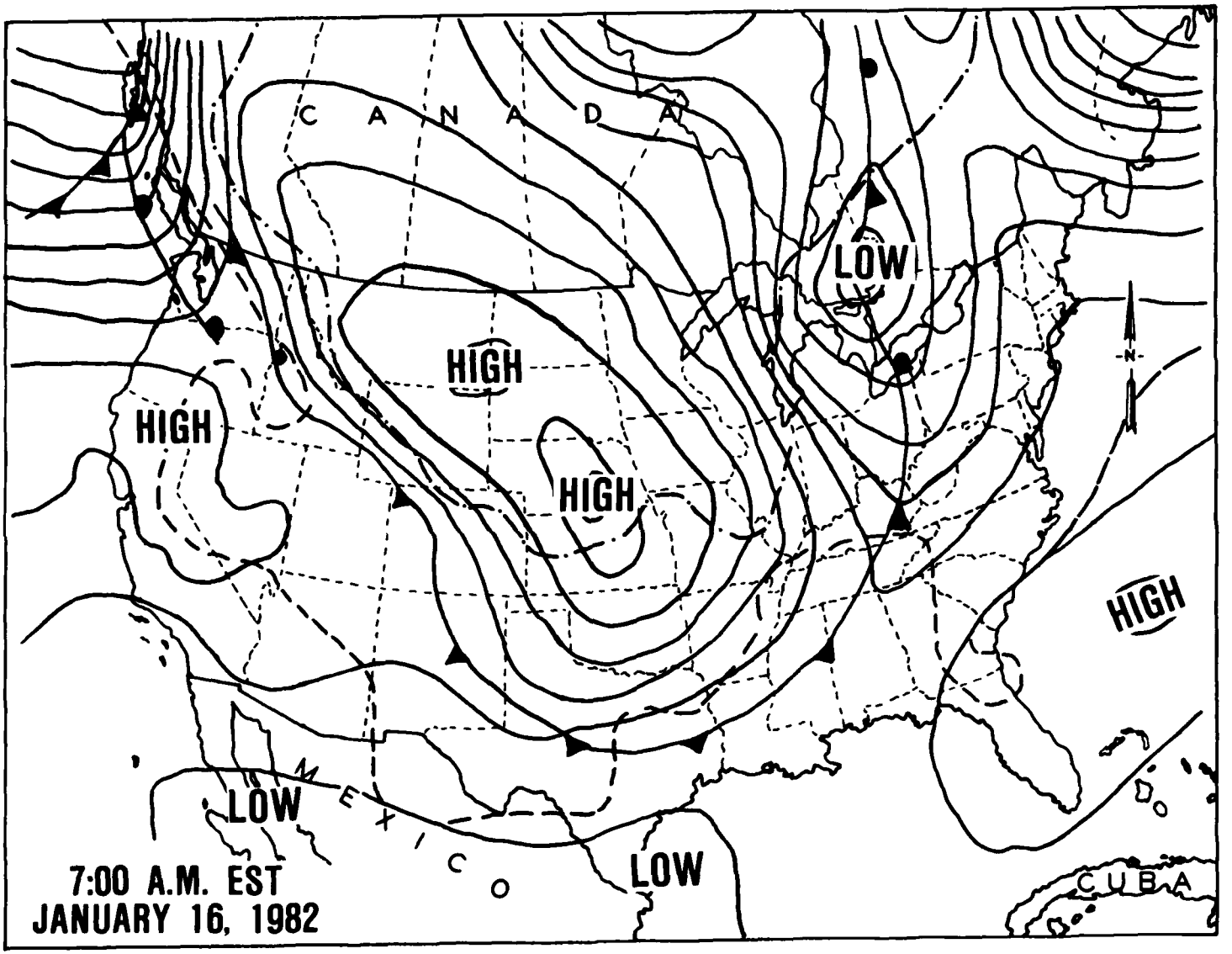

Figure 3. Isobaric contour map of FOR circulation

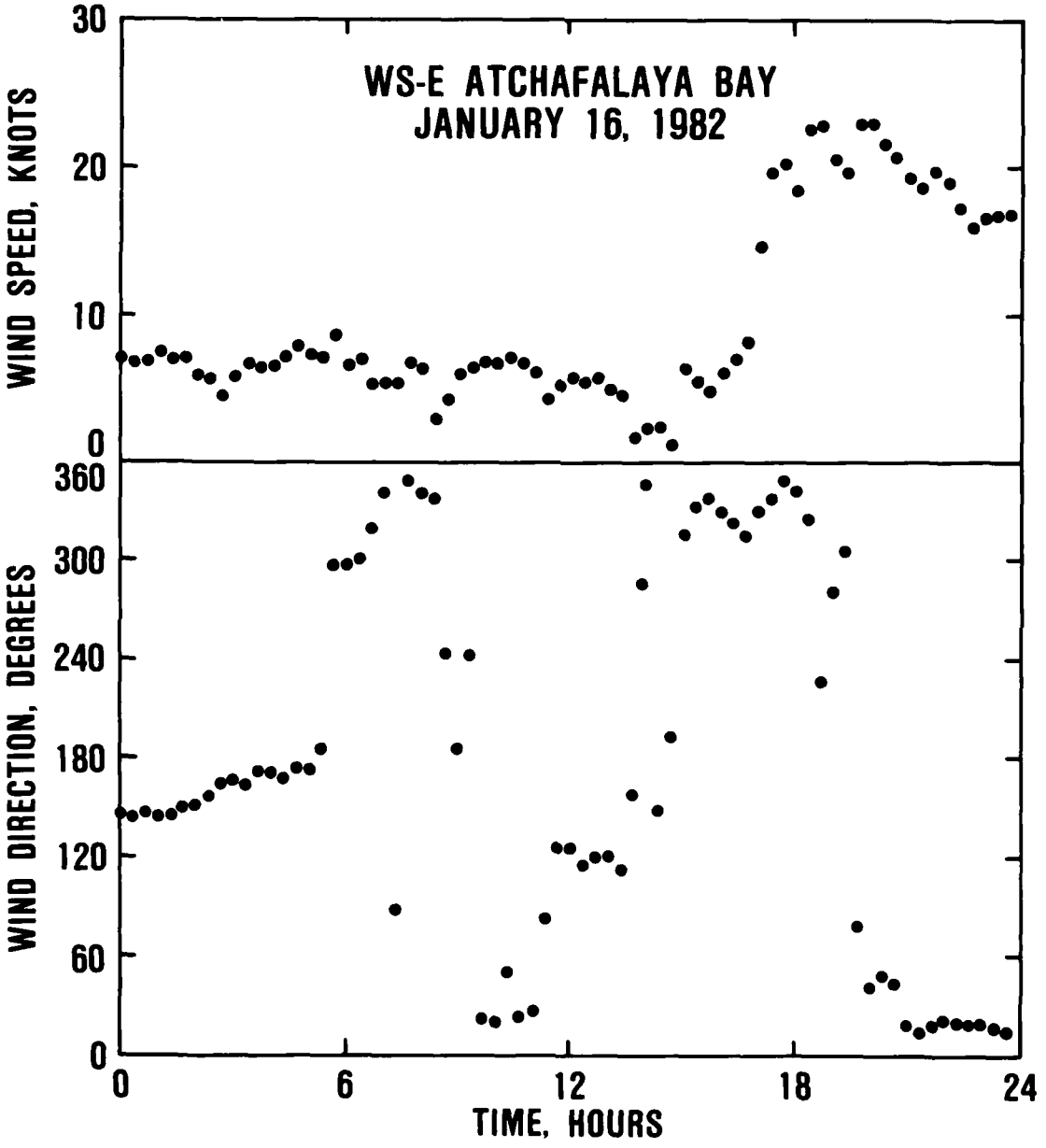

Figure 4. Prototype wind measurements during FOR circulation

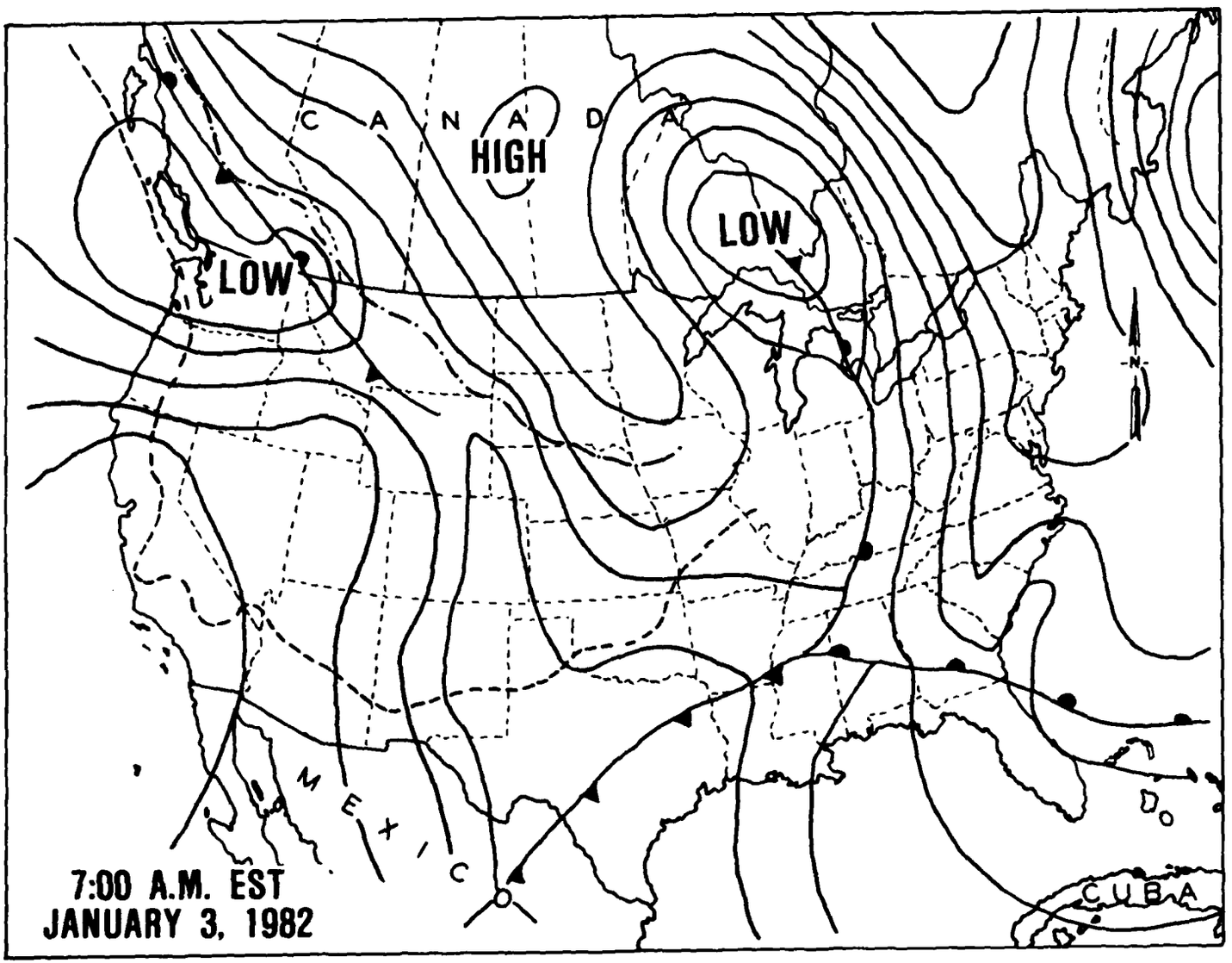

Figure 5. Isobaric contour map of FGR circulation

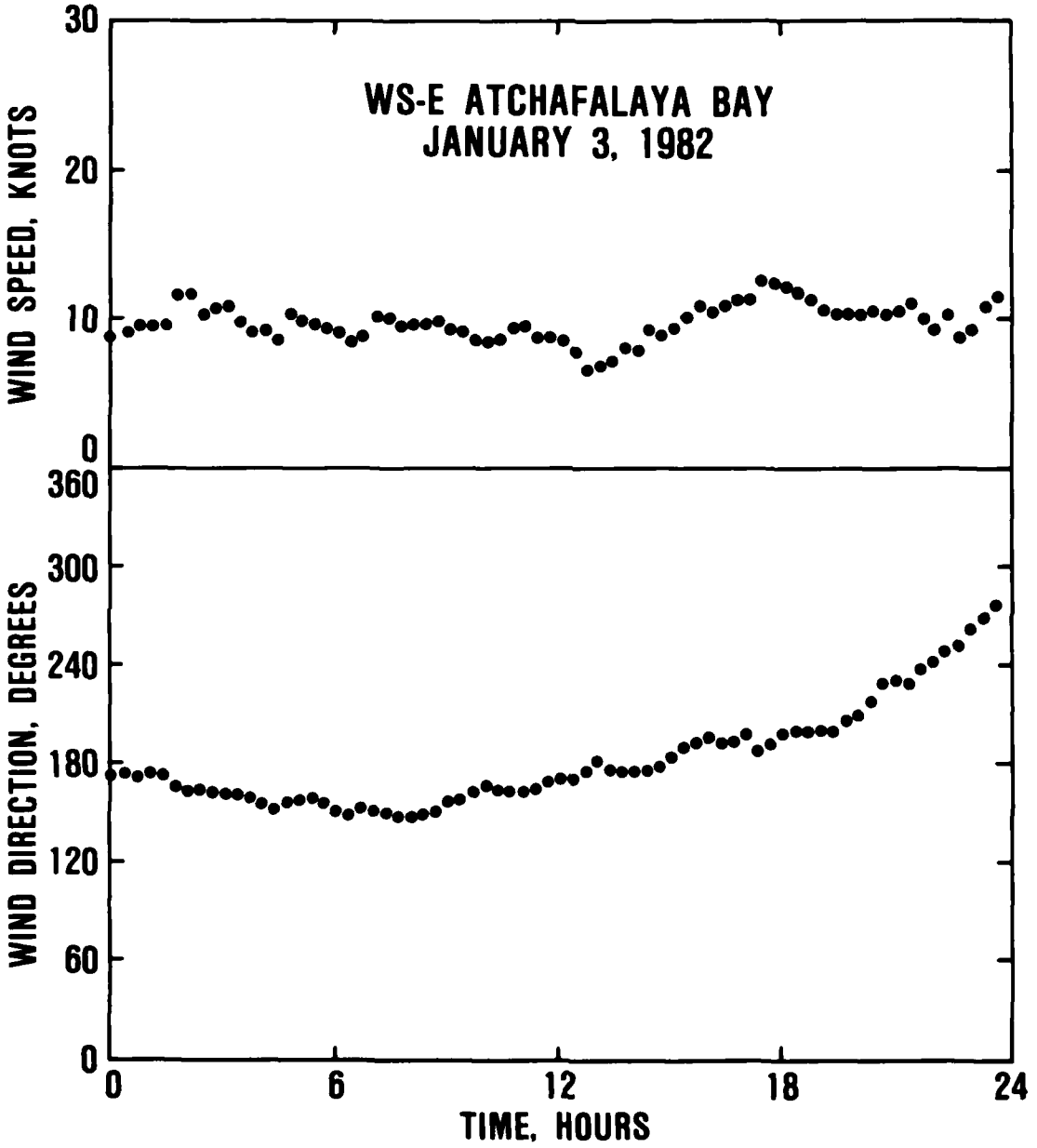

Figure 6. Prototype wind measurements during FGR circulation

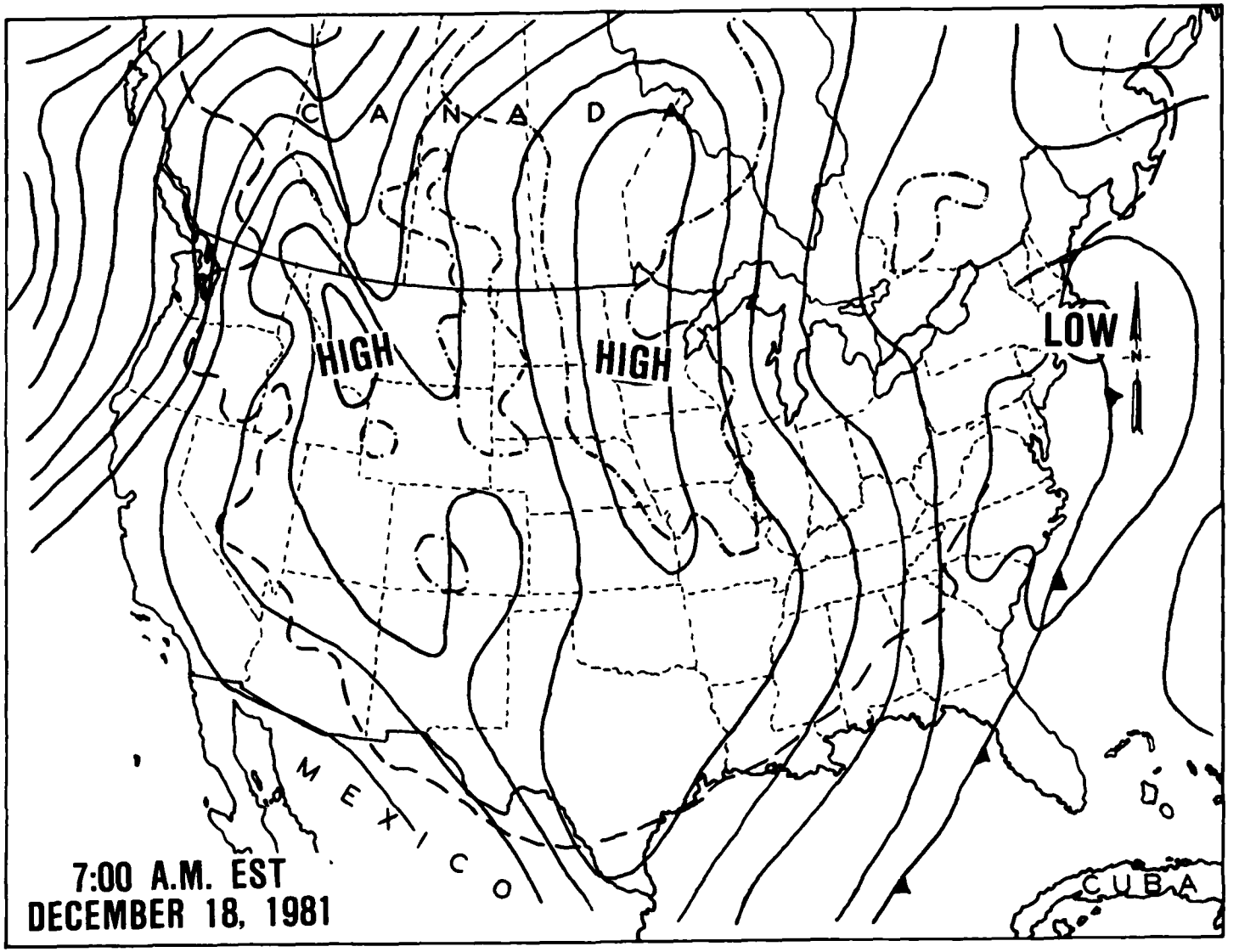

Figure 7. Isobaric contour map of CH circulation

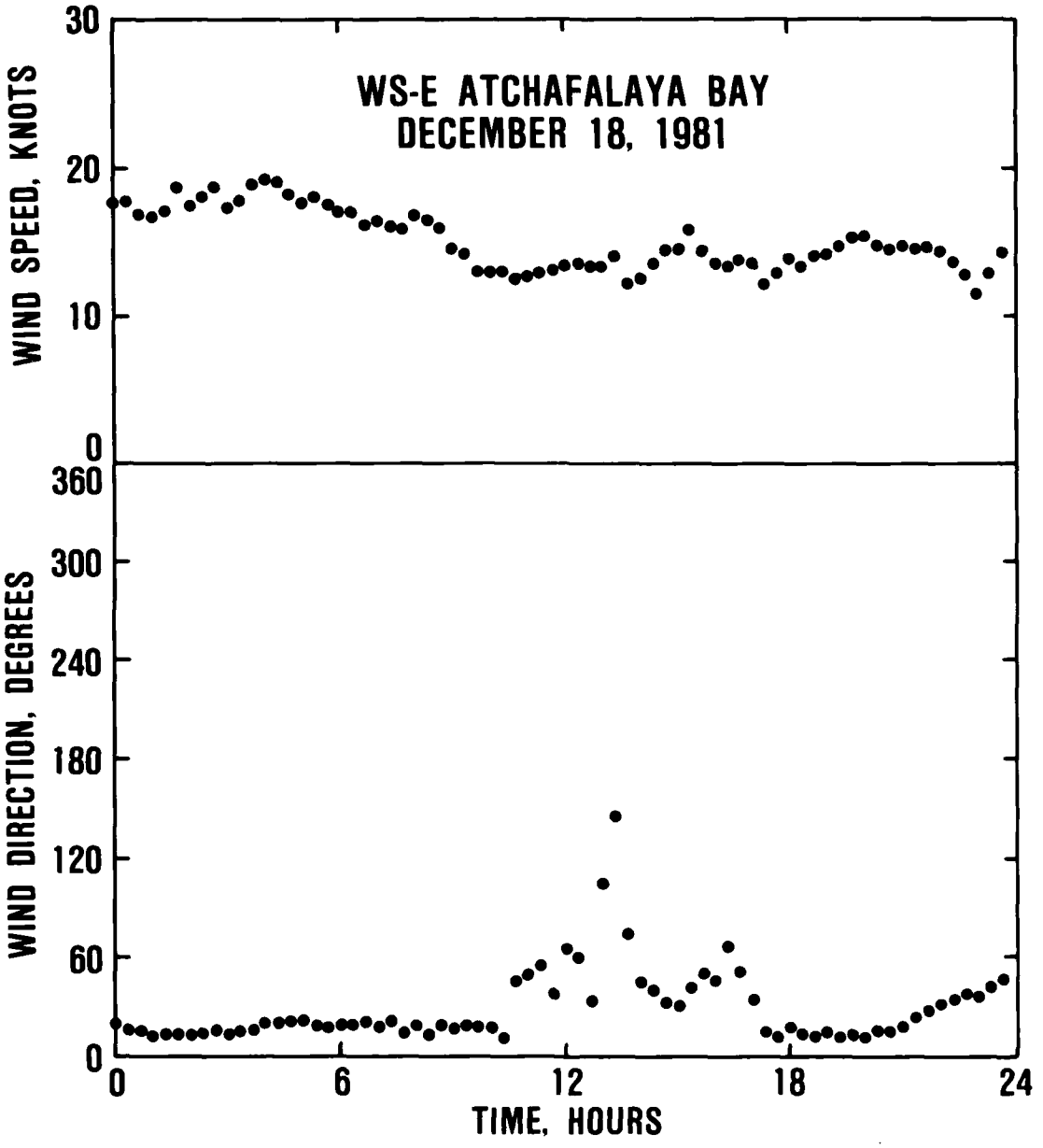

Figure 8. Prototype wind measurements during CH circulation

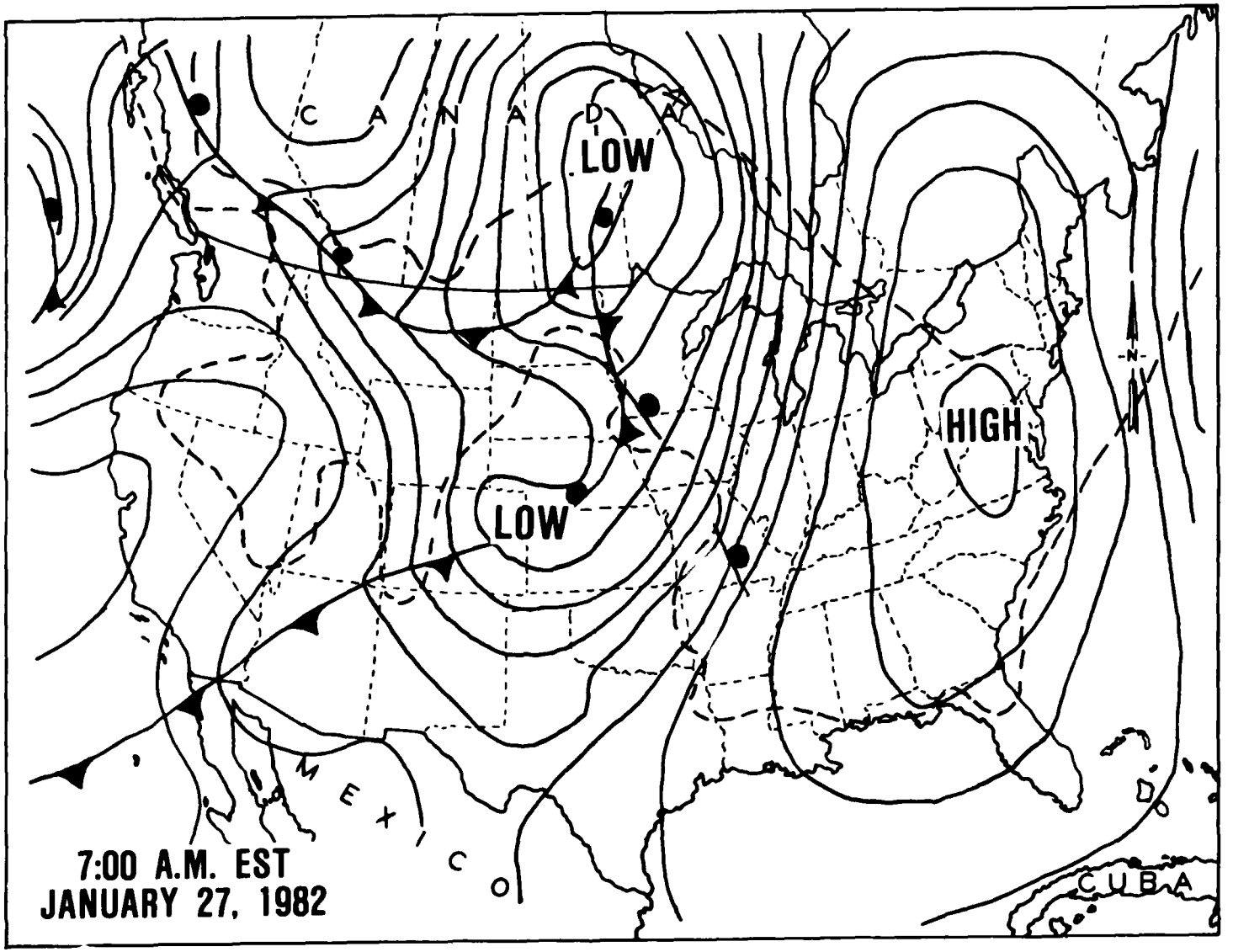

Figure 9. Isobaric contour map of CR circulation

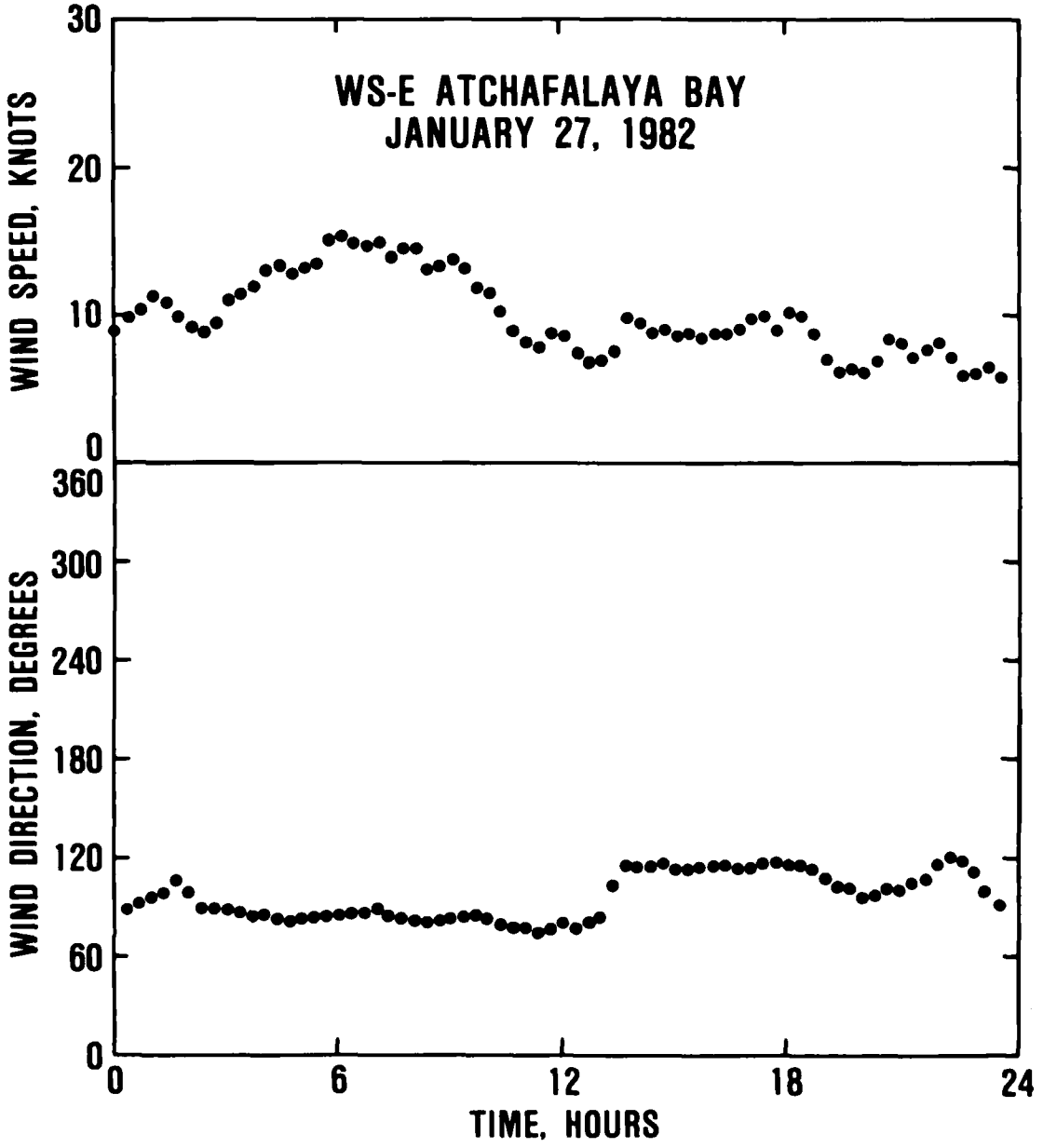

Figure 10. Prototype wind measurements during CR circulation

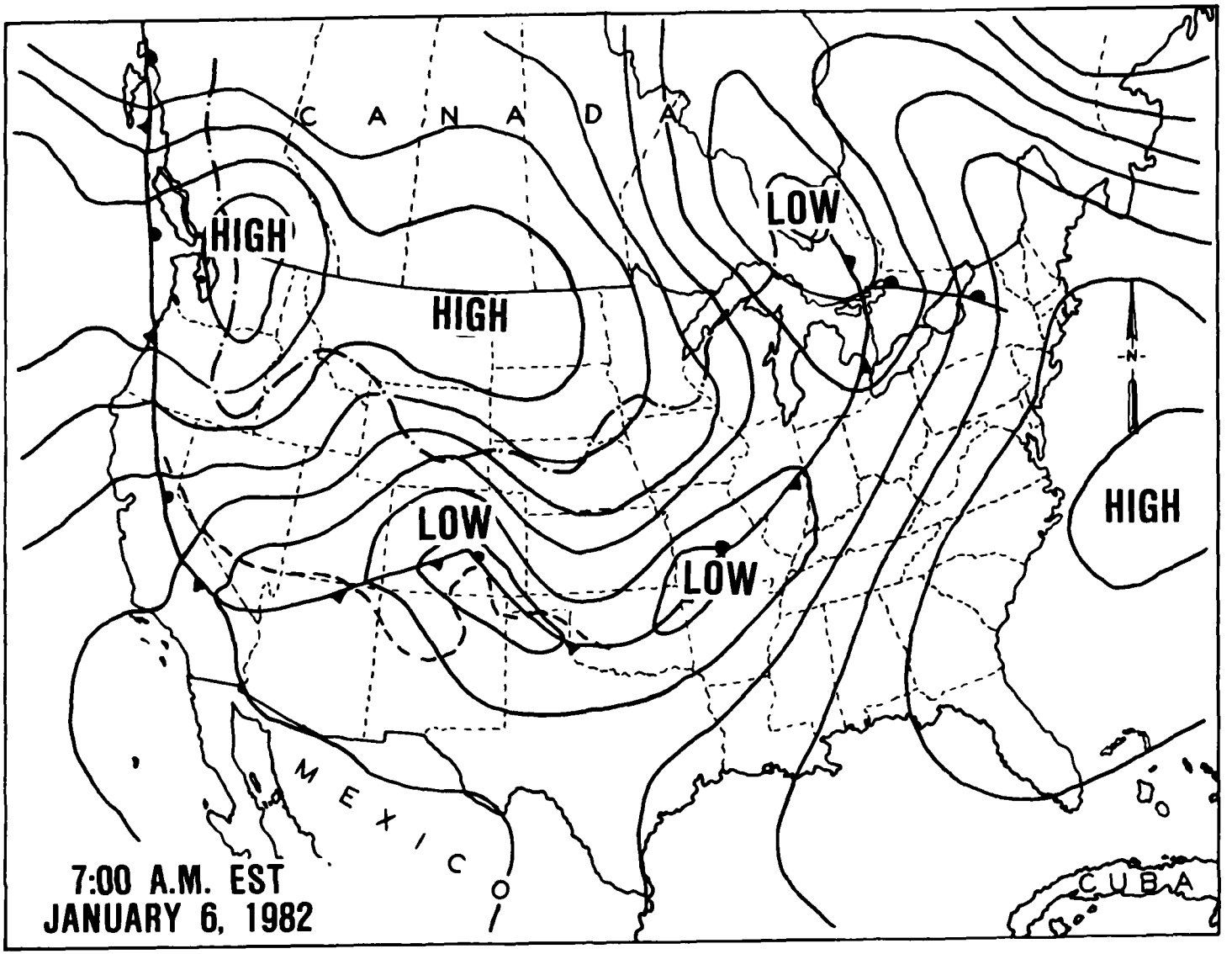

Figure 11. Isobaric contour map of GR circulation

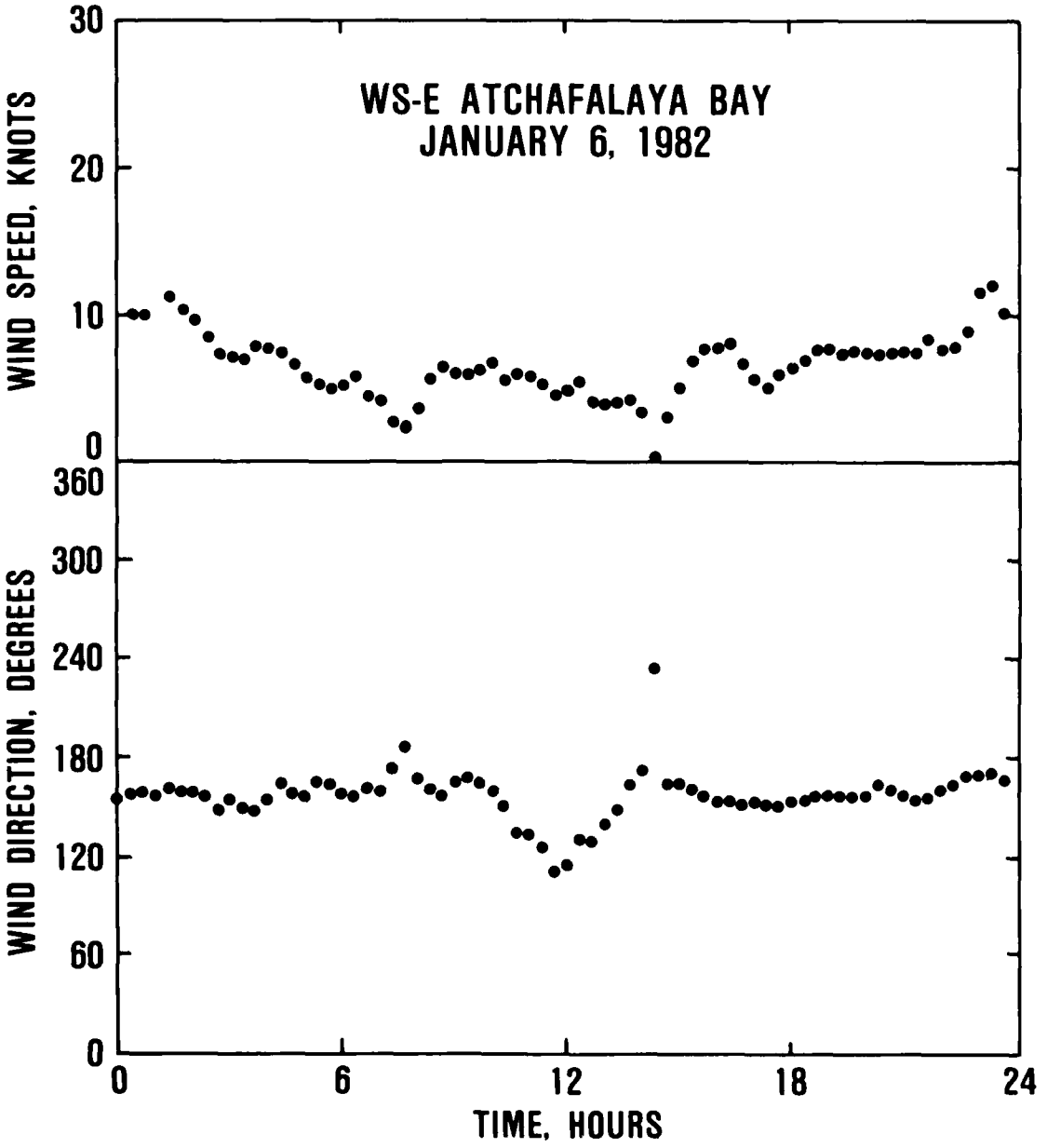

Figure 12. Prototype wind measurements during GR circulation

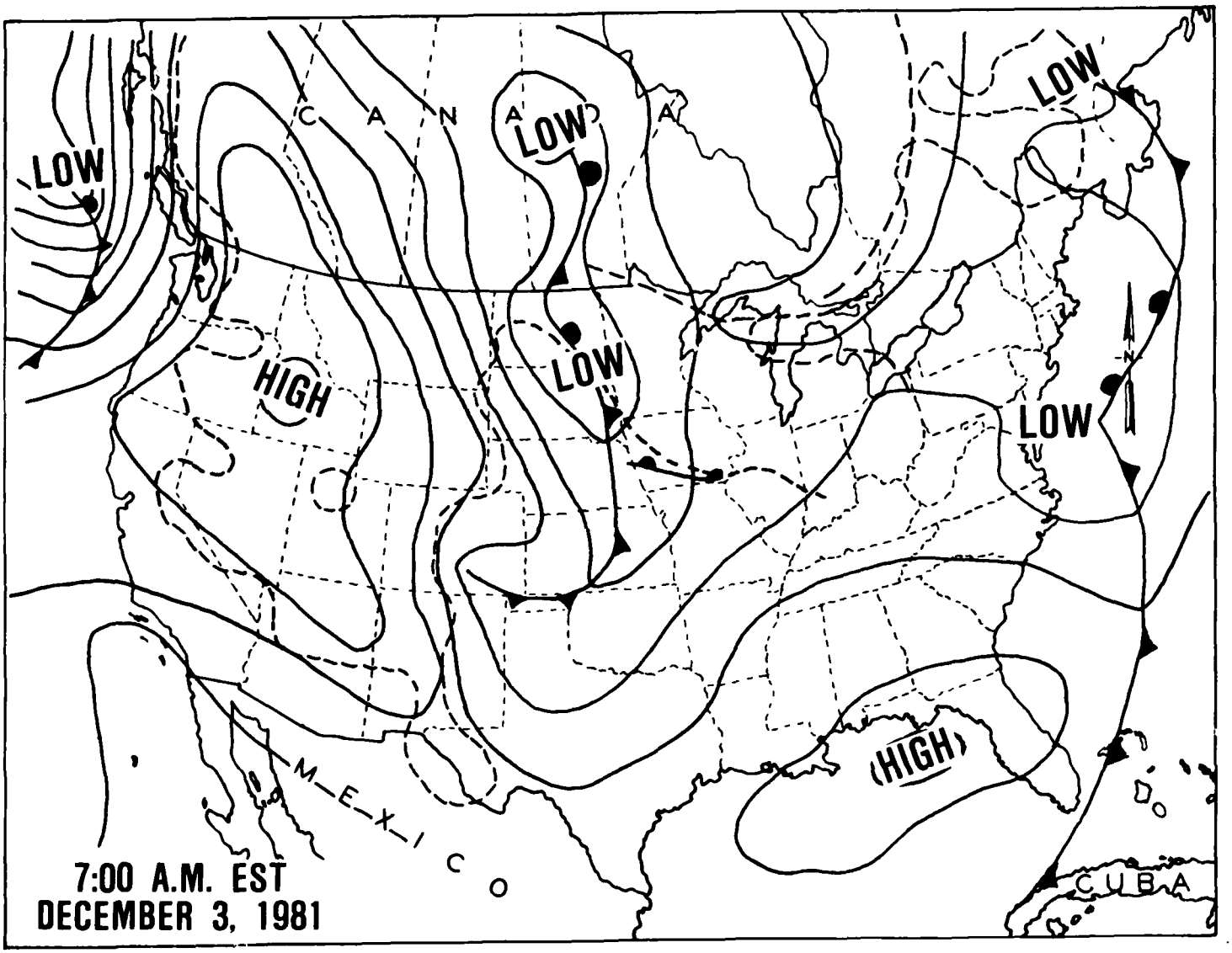

Figure 13. Isobaric contour map of GH circulation

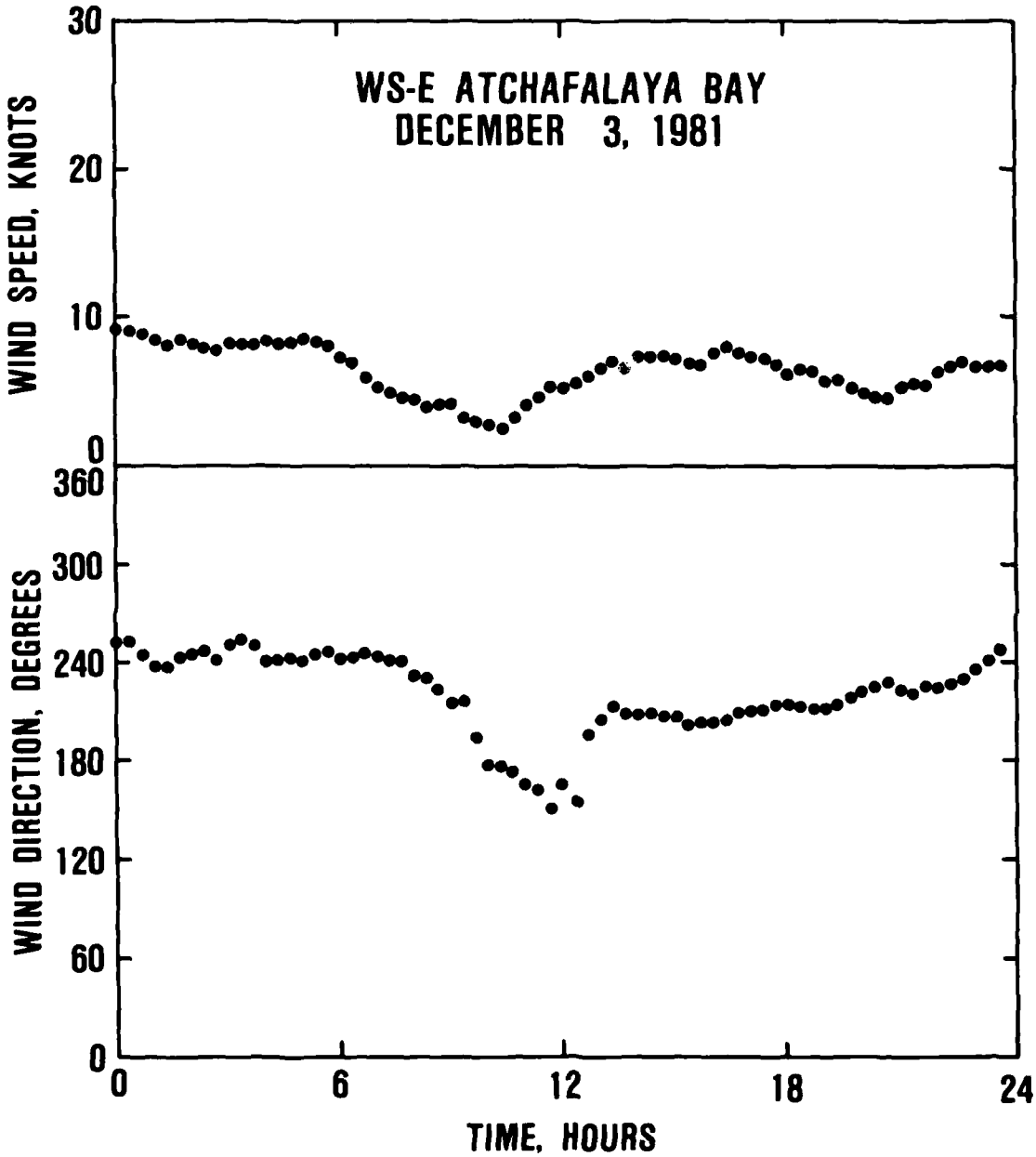

Figure 14. Prototype wind measurements during GH circulation

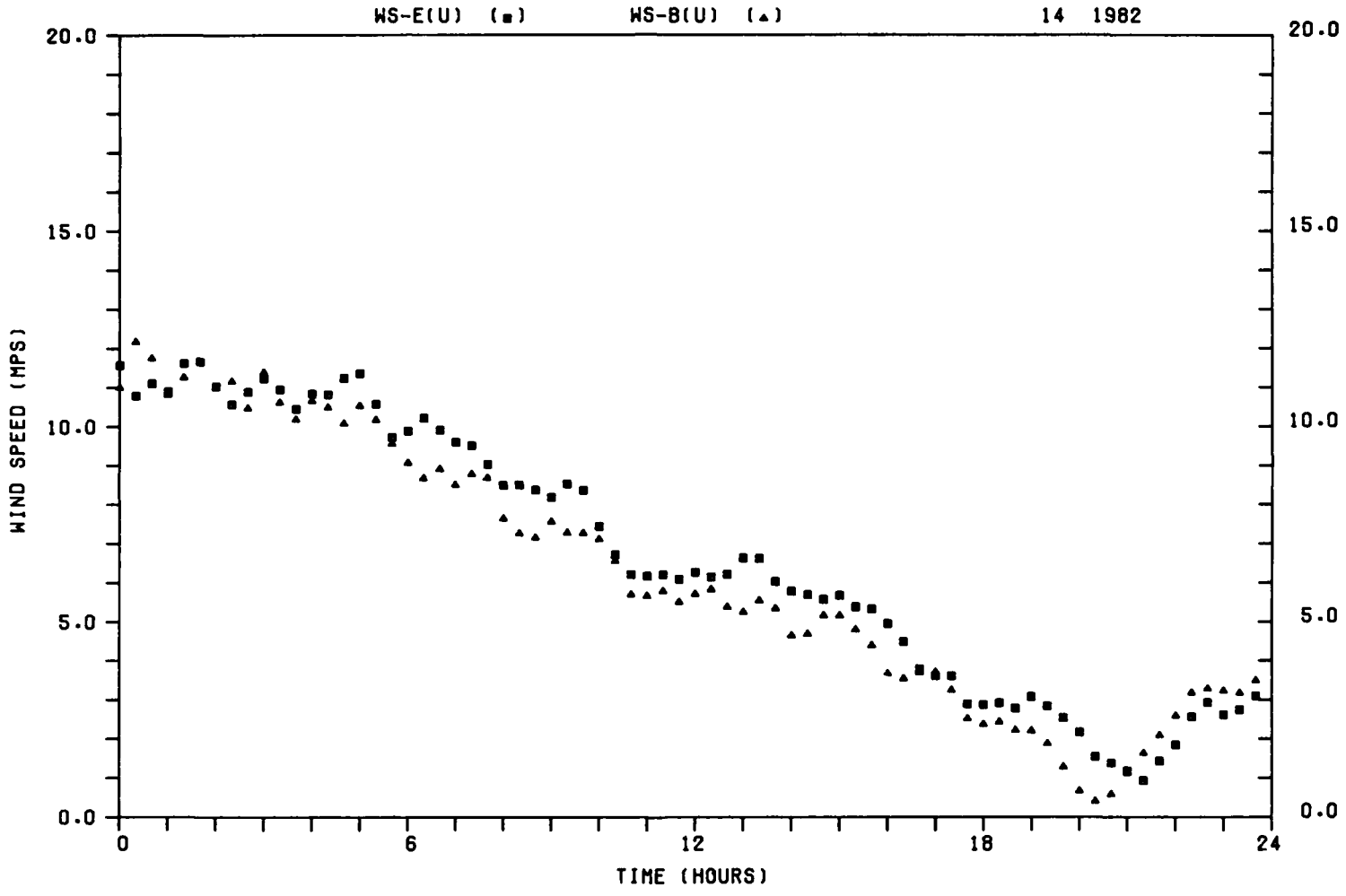

Figure 15. Comparison of wind speed at stations WS-E and WS-B

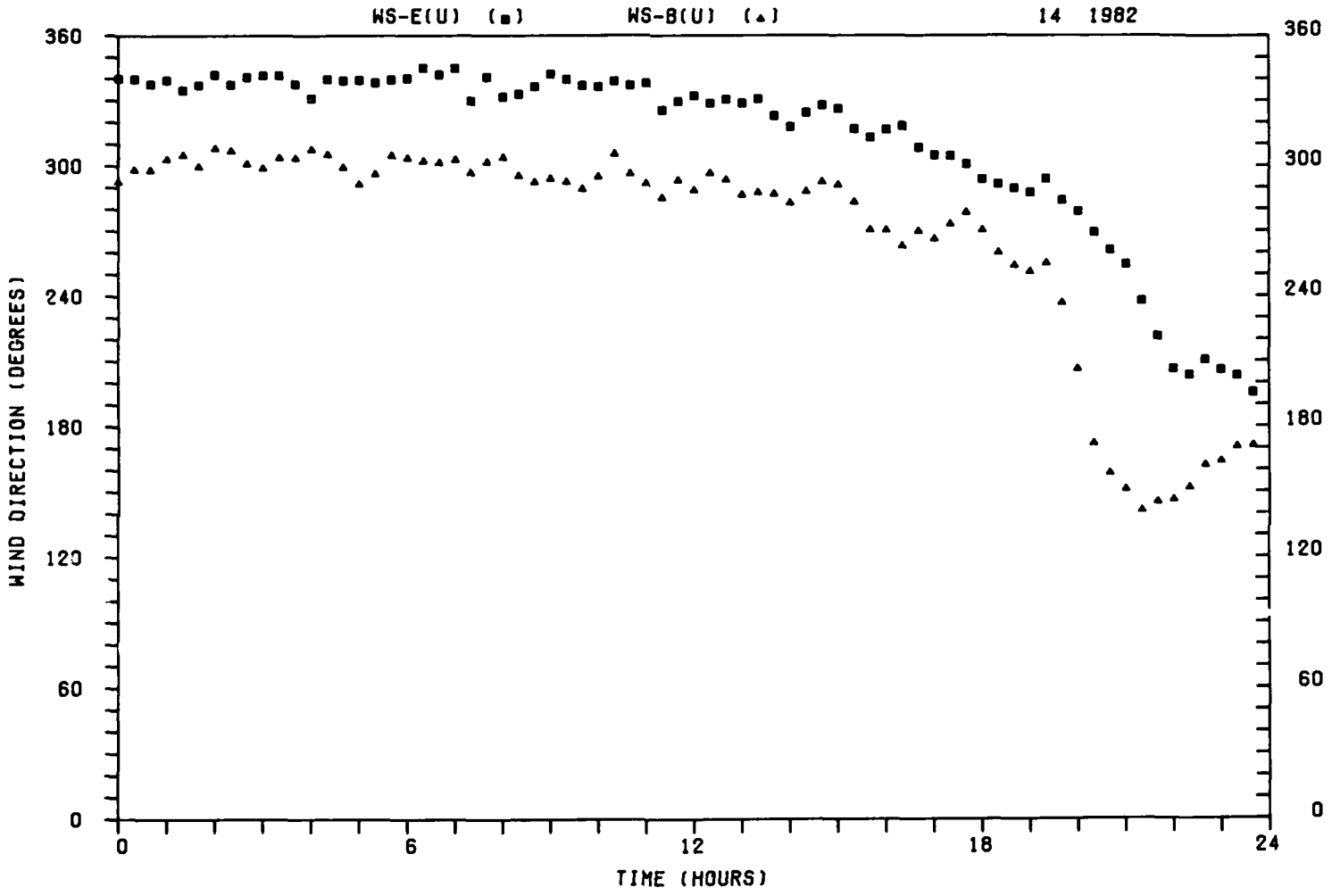

Figure 16. Comparison of wind direction at stations WS-E and WS-B

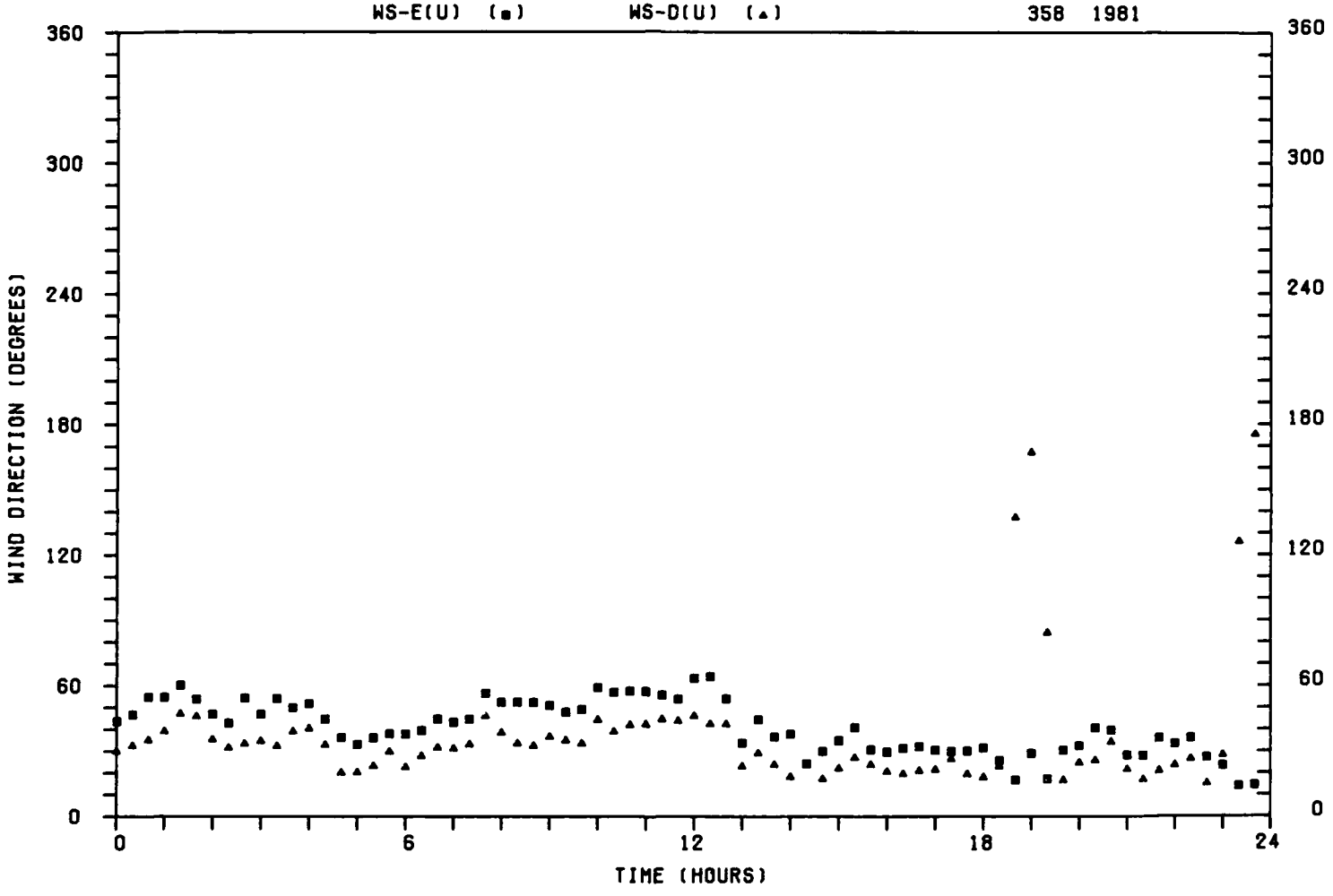

Figure 17. Comparison of wind speed at stations WS-E and WS-D

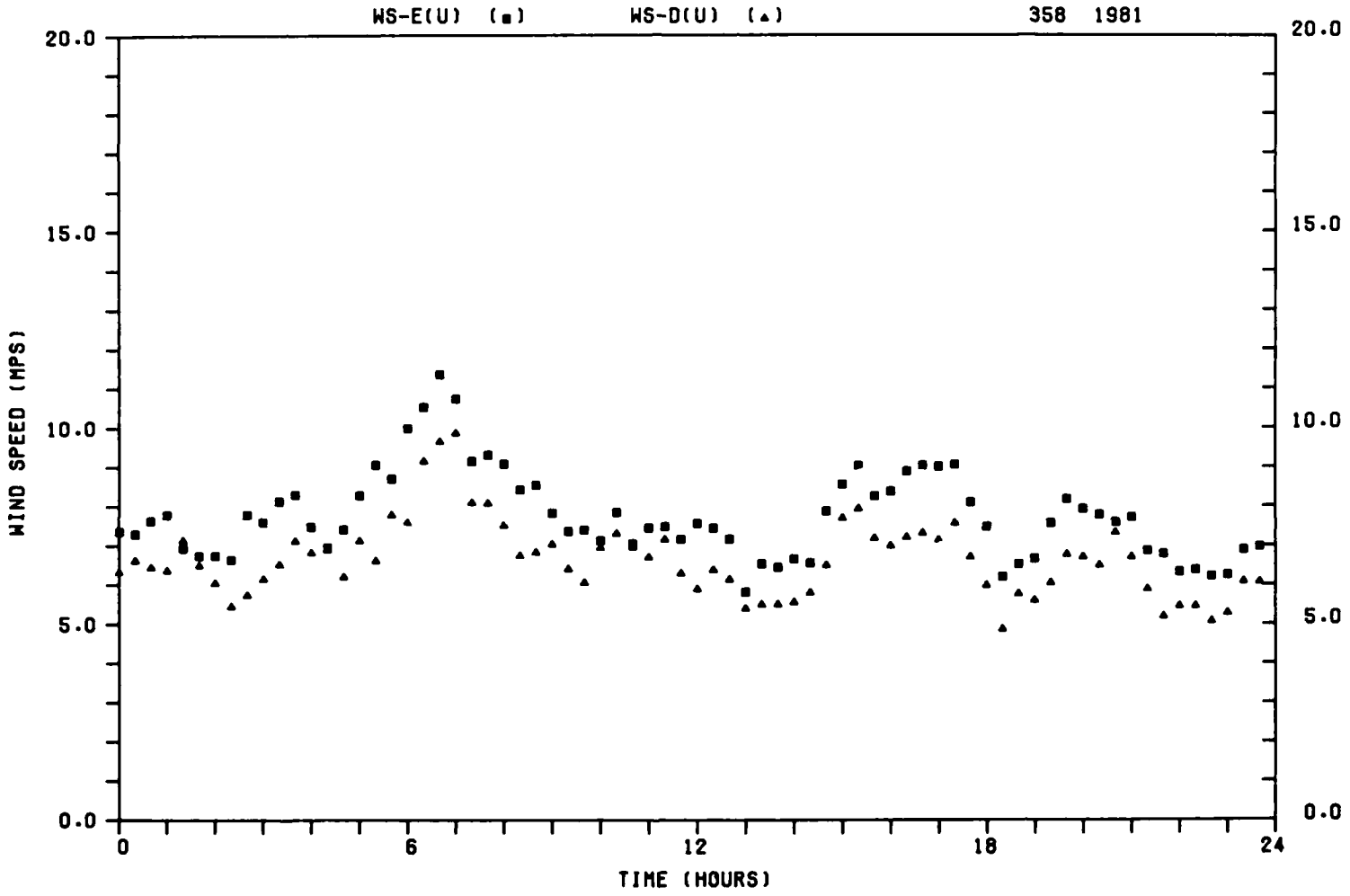

Figure 18. Comparison of wind direction at stations WS-E and WS-D

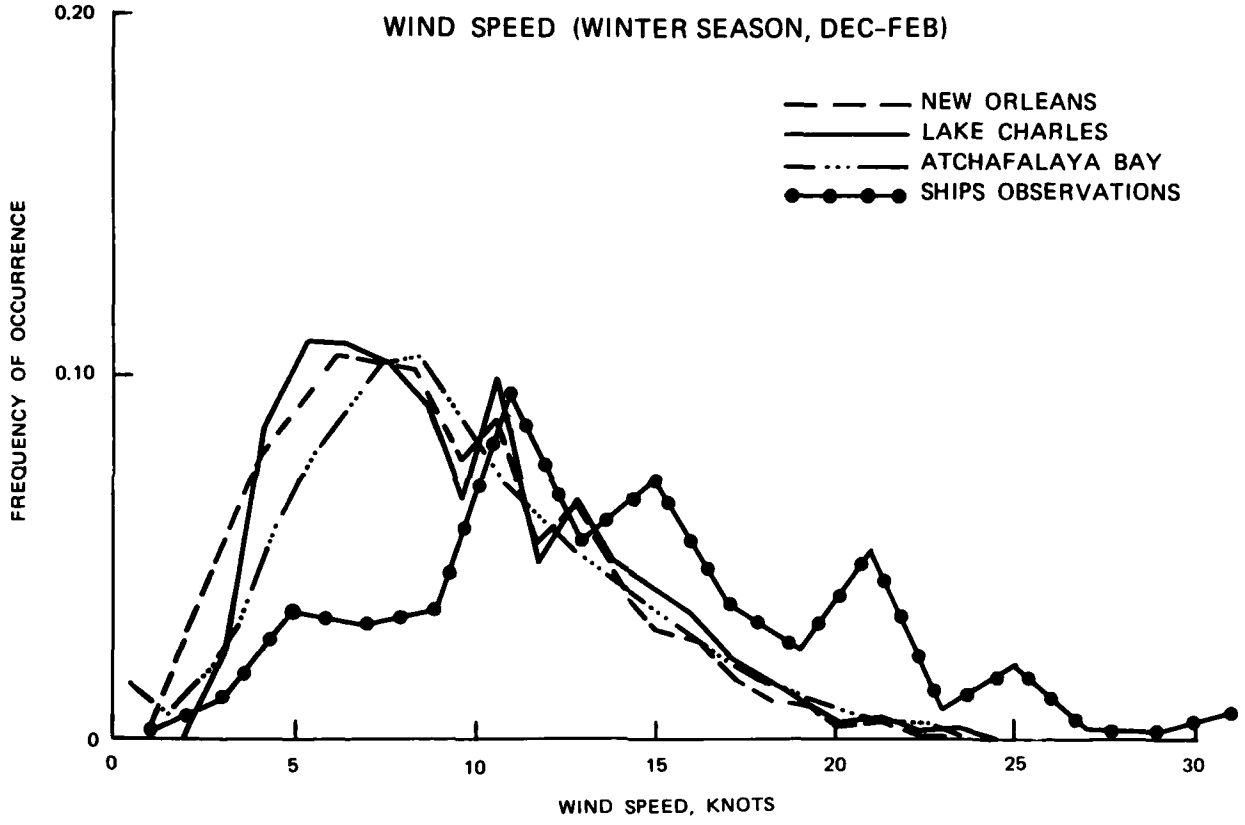

Figure 19. Frequency of occurrence of wind speed during winter (all weather types)

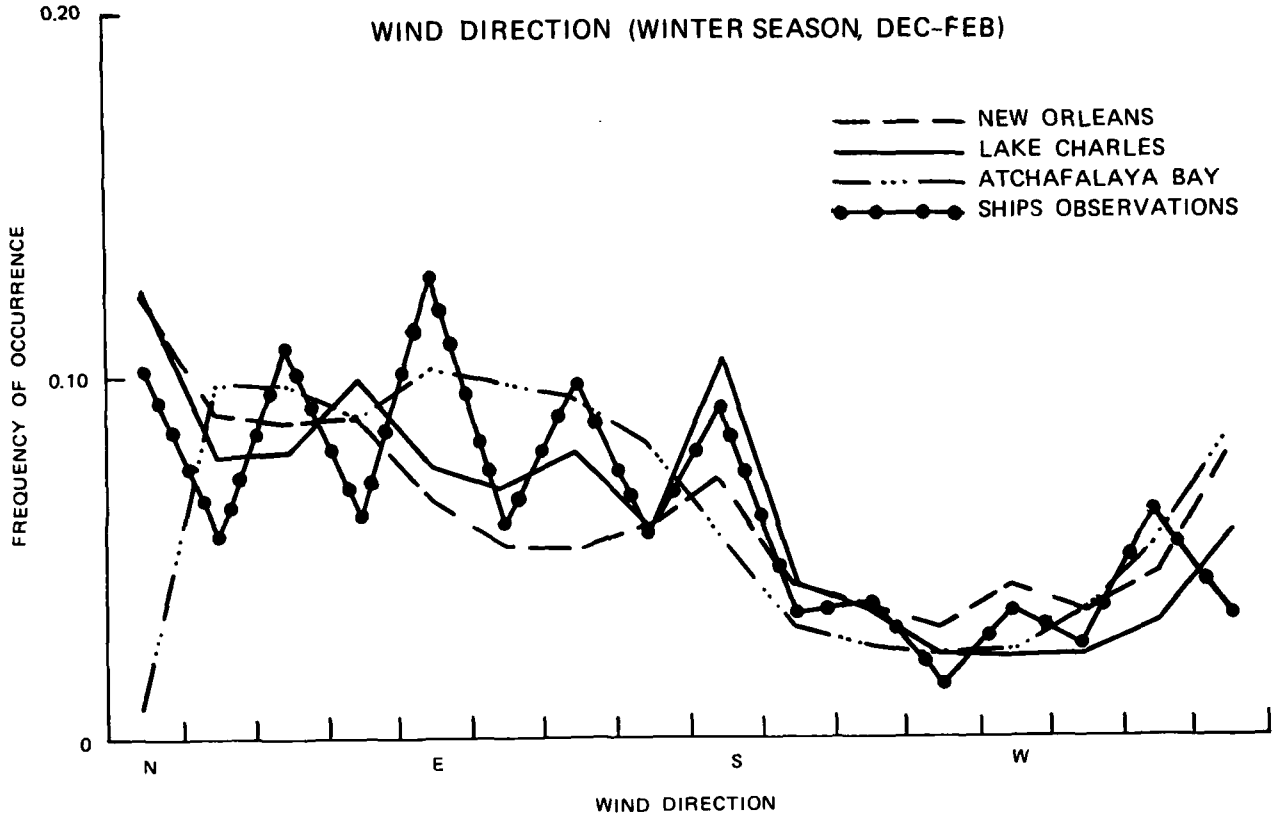

Figure 20. Frequency of occurrence of wind direction during winter (all weather types)

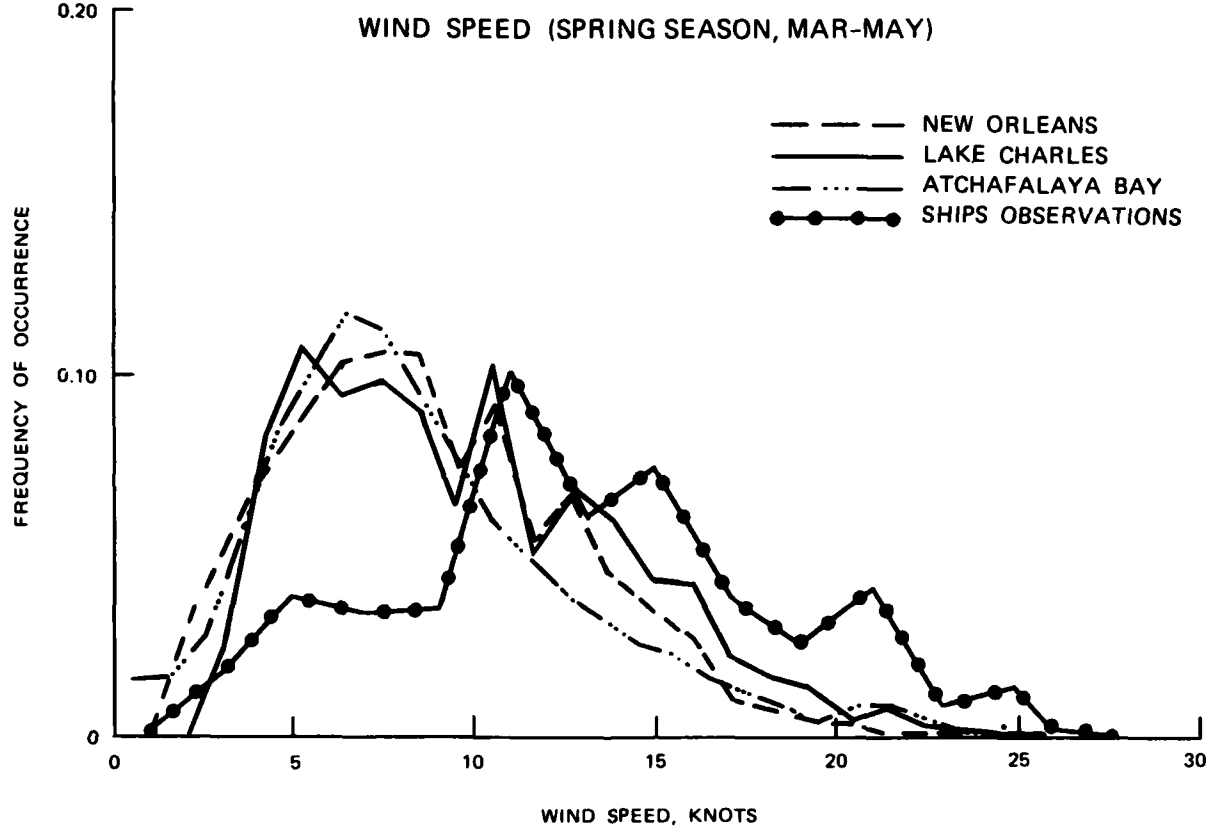

Figure 21. Frequency of occurrence of wind speed during spring (all weather types)

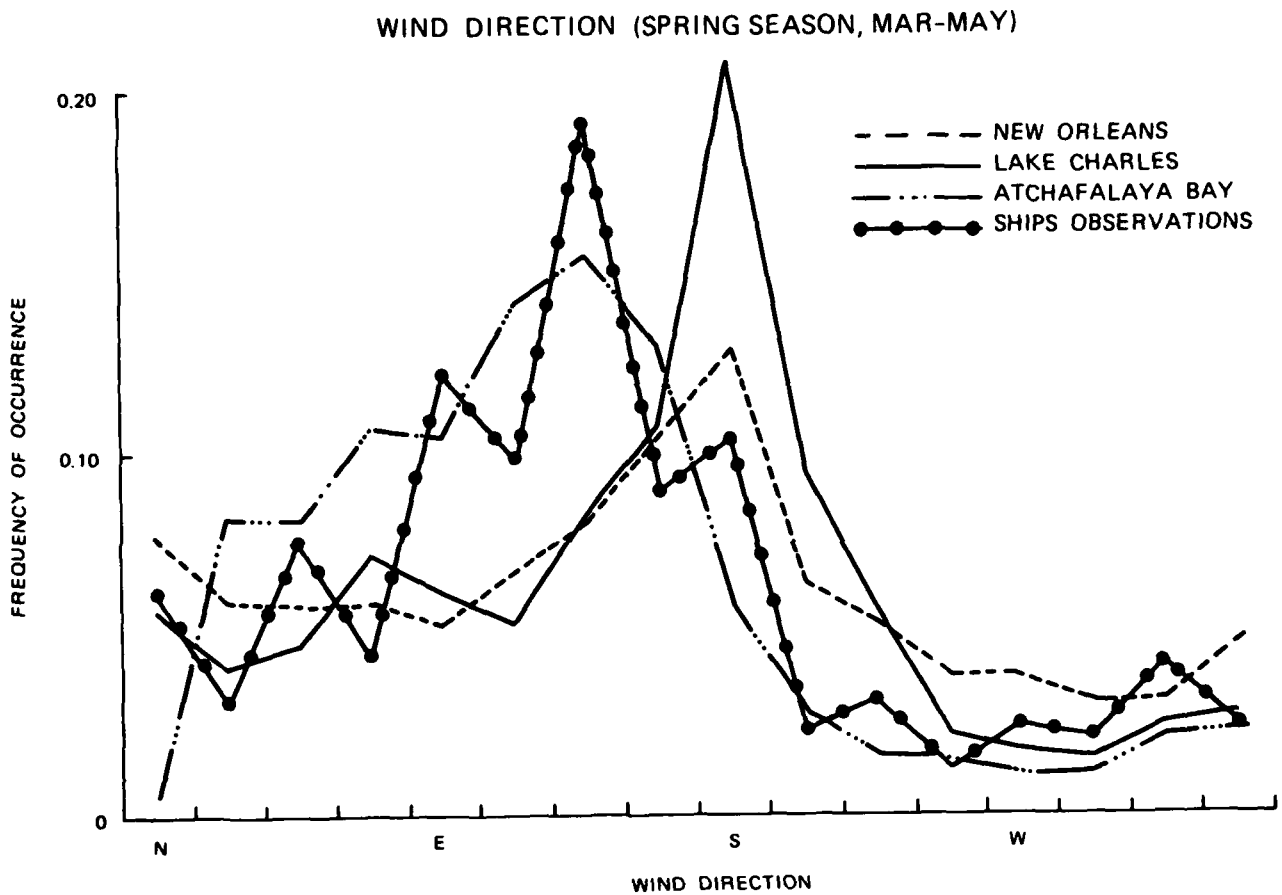

Figure 22. Frequency of occurrence of wind direction during spring (all weather types)

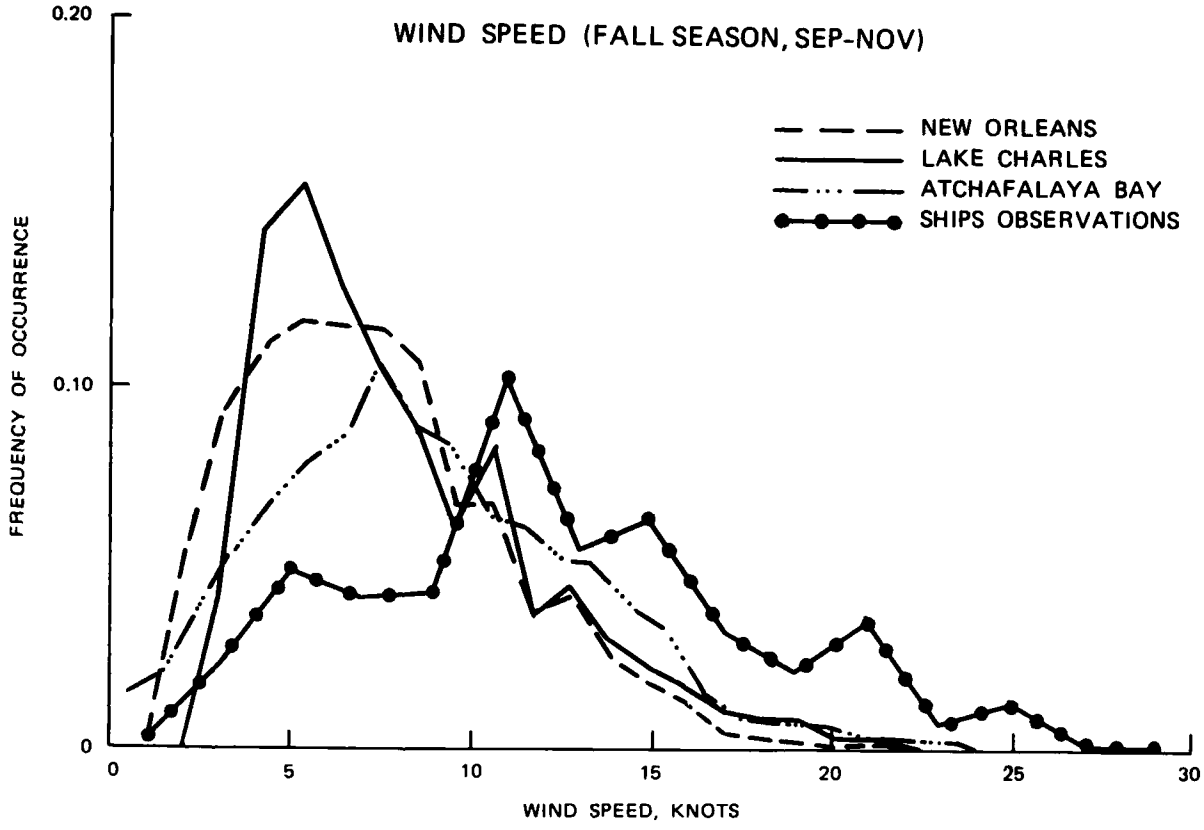

Figure 23. Frequency of occurrence of wind speed during summer (all weather types)

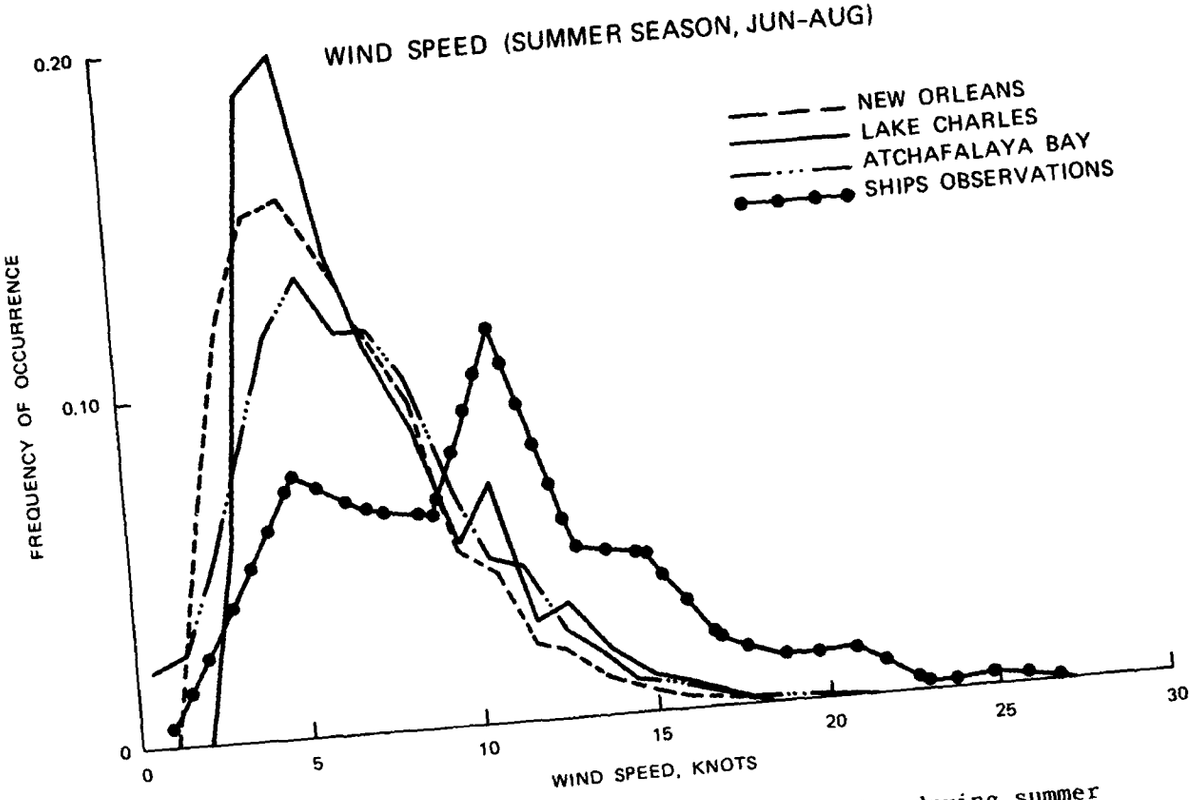

Figure 24. Frequency of occurrence of wind direction during summer (all weather types)

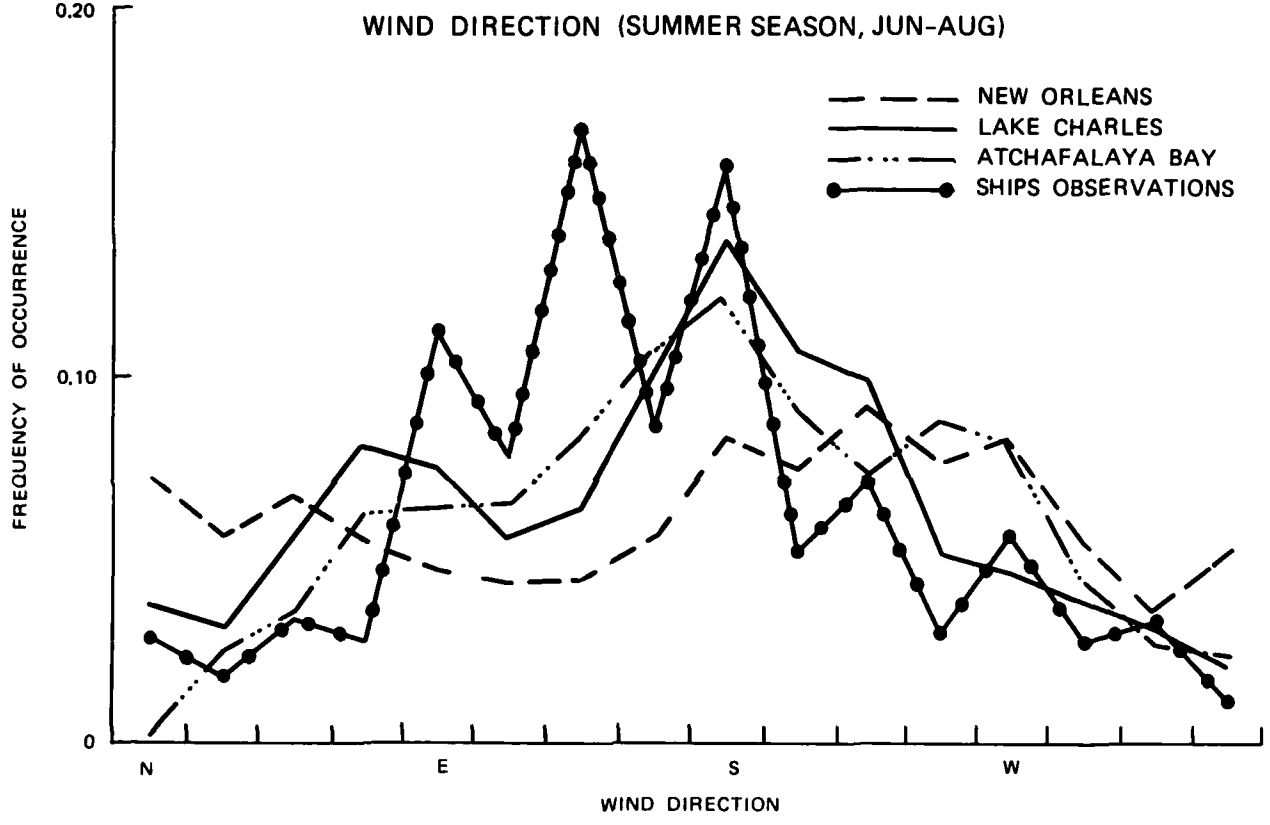

Figure 25. Frequency of occurrence of wind speed during fall (all weather types)

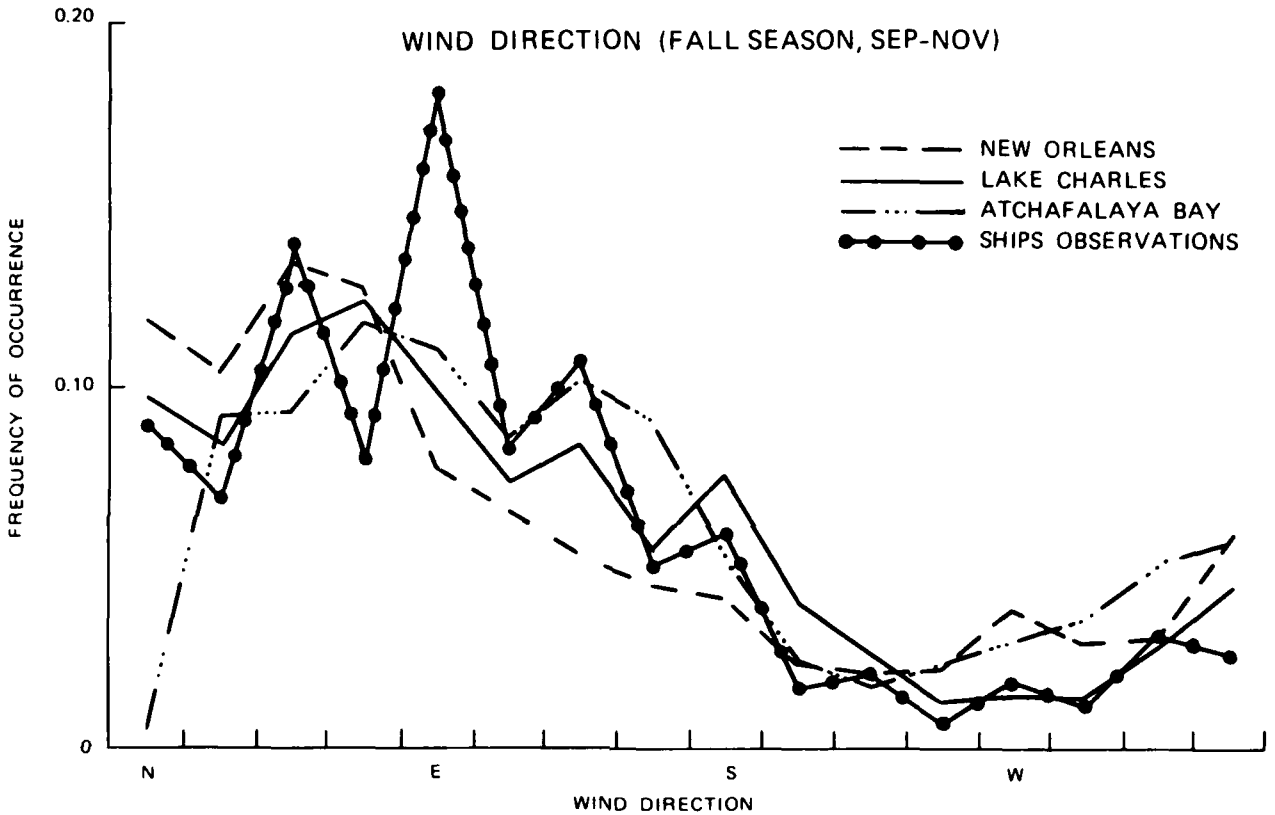

Figure 26. Frequency of occurrence of wind direction during fall (all weather types)

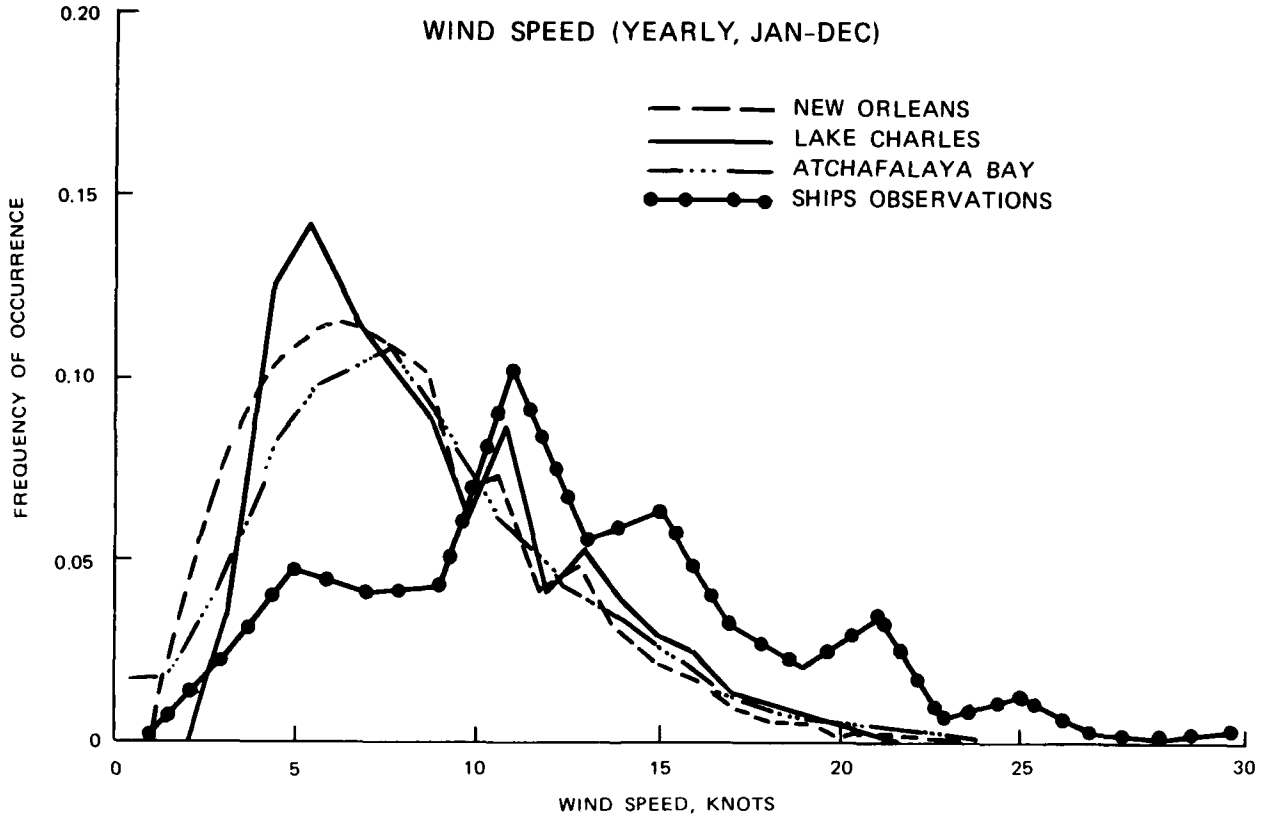

Figure 27. Cumulative yearly frequency of occurrence of wind speed (all weather types)

AD-A152 818 THE ATCHAFALAYA RIVER DELTA REPORT 9 WIND CLIMATOLOGY 2/2
(U) ARMY ENGINEER WATERWAYS EXPERIMENT STATION
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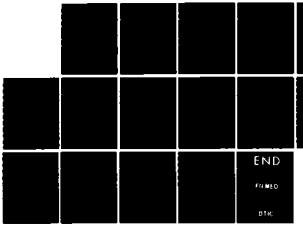
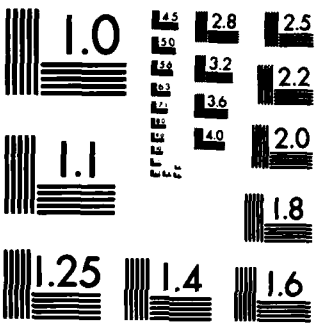
UNCLASSIFIED WES/TR/HL-82-15/9 F/G 4/2 NL





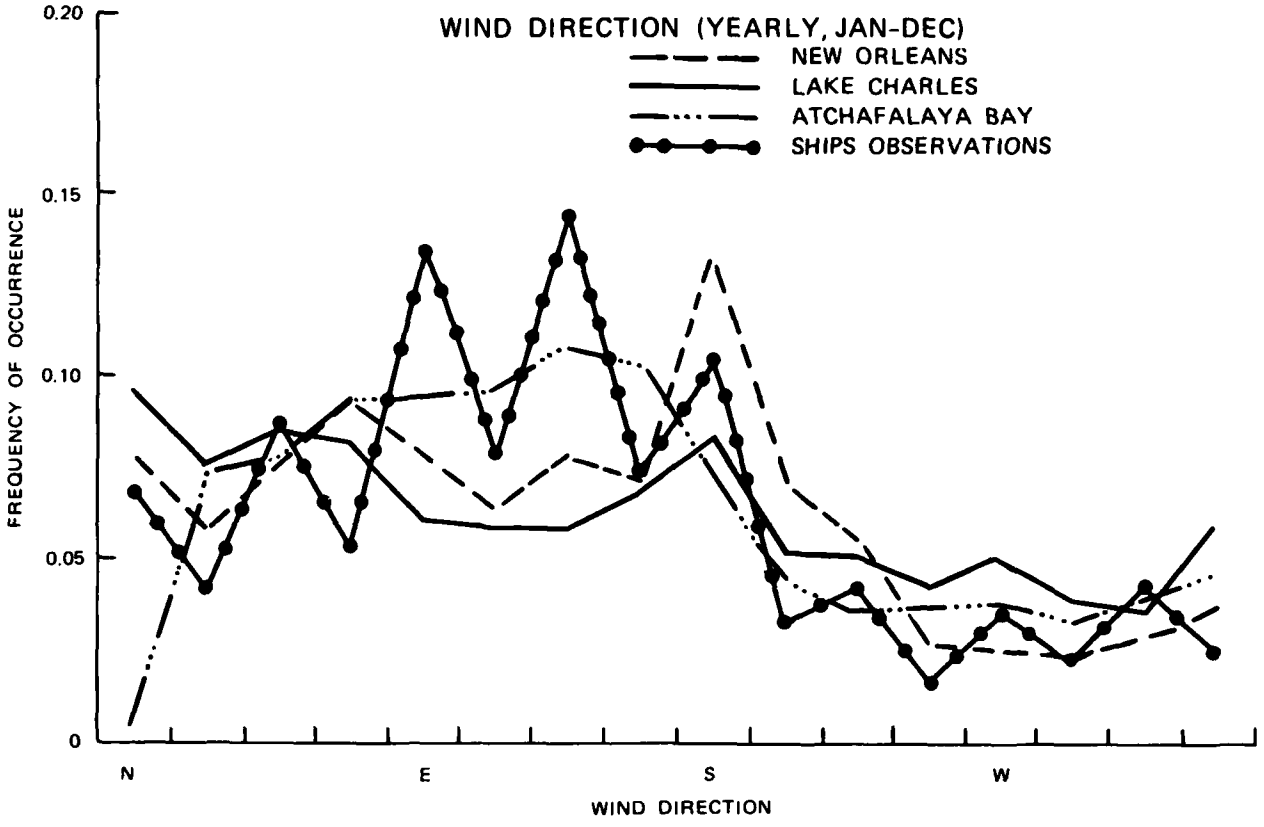


Figure 28. Cumulative yearly frequency of occurrence of wind direction (all weather types)

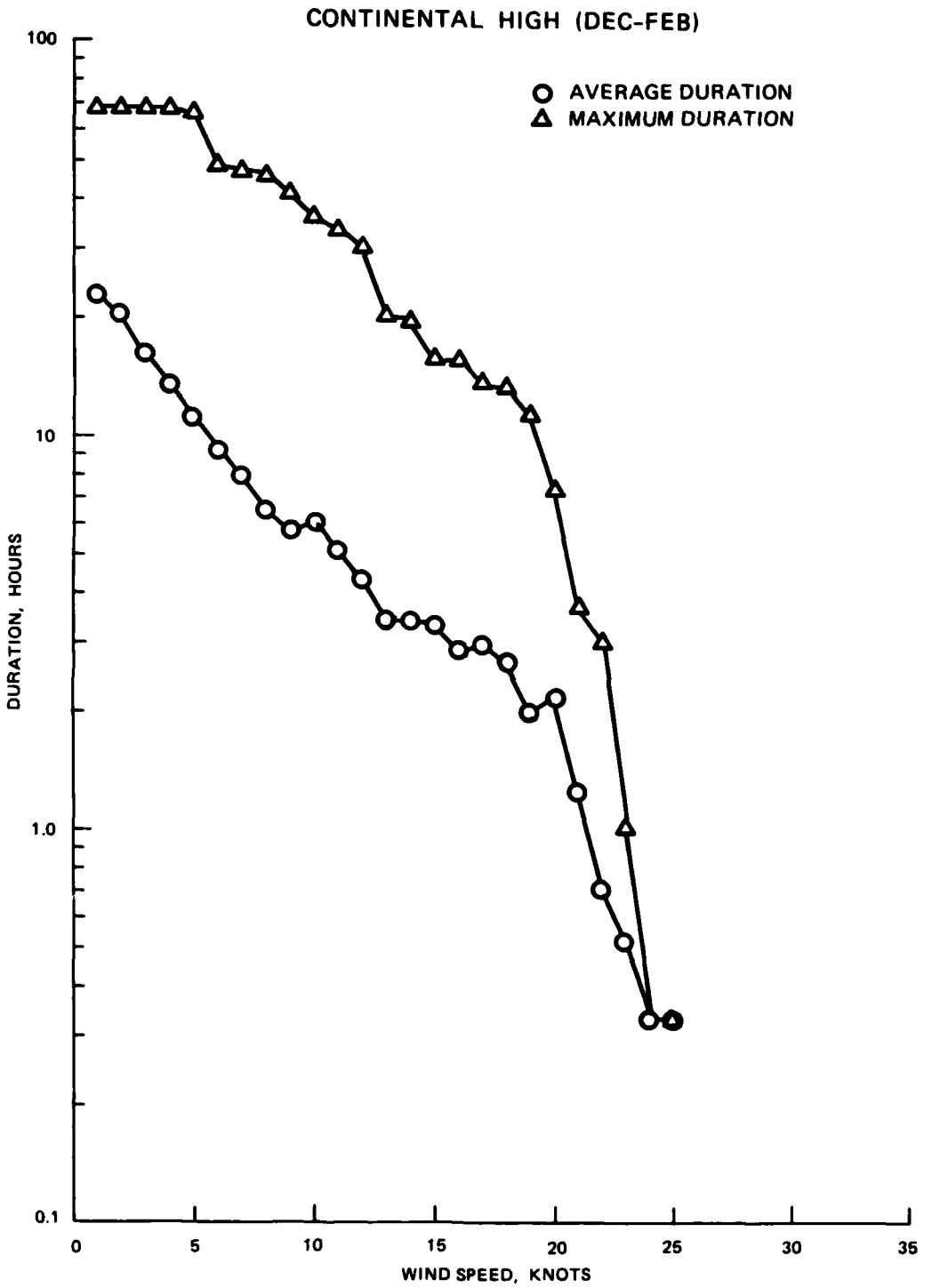


Figure 29. Duration of CH winds during winter

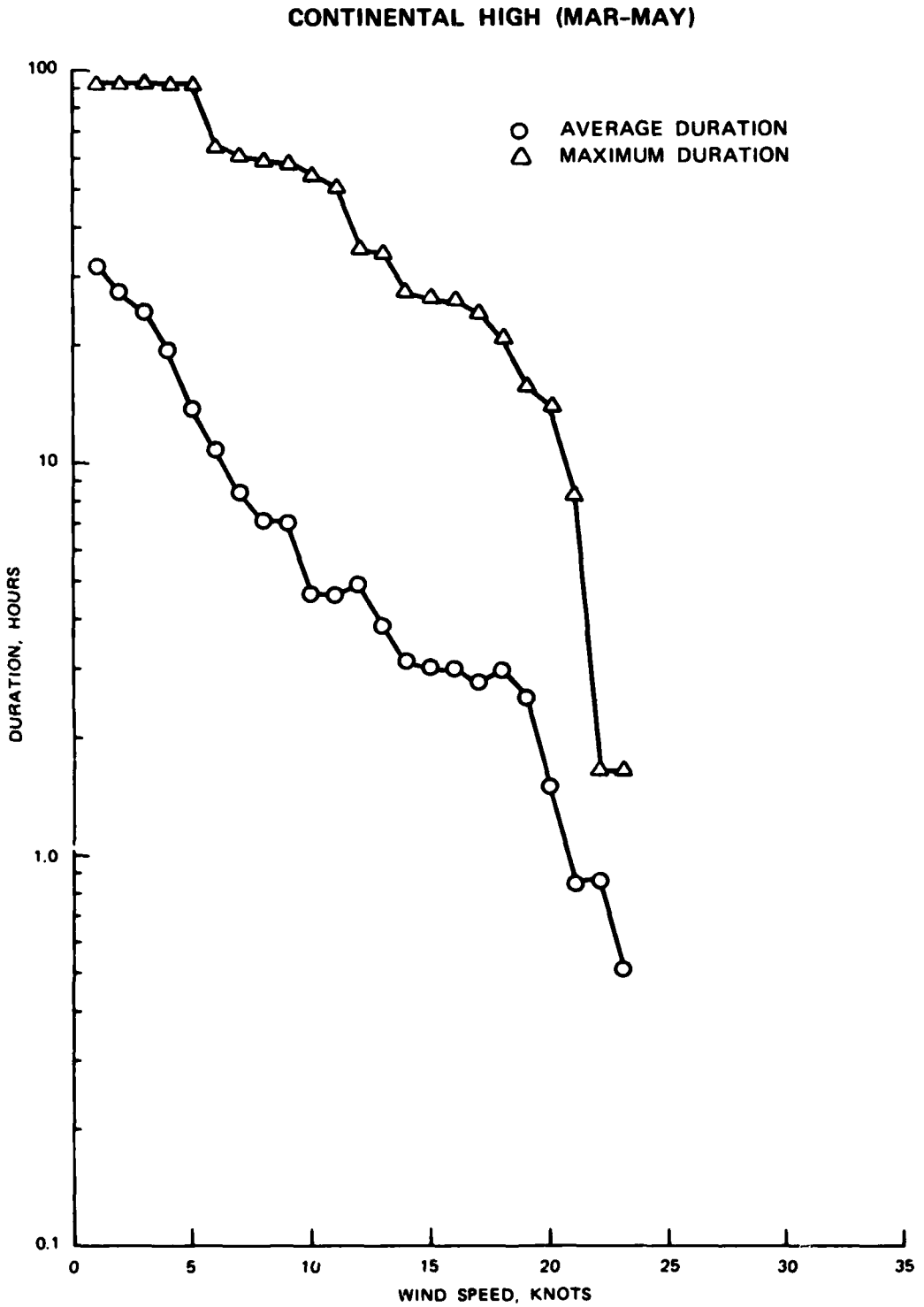


Figure 30. Duration of CH winds during spring

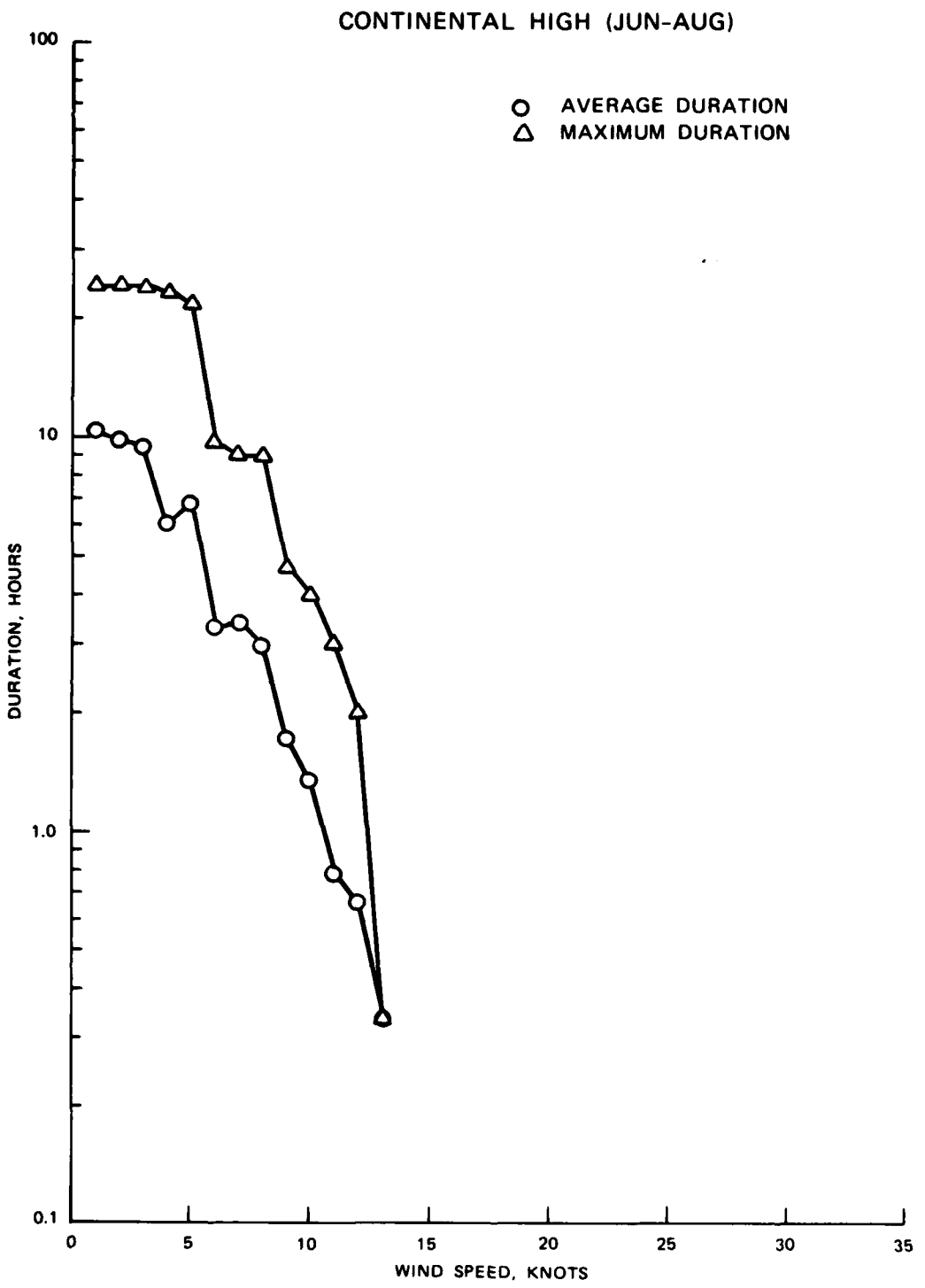


Figure 31. Duration of CH winds during summer

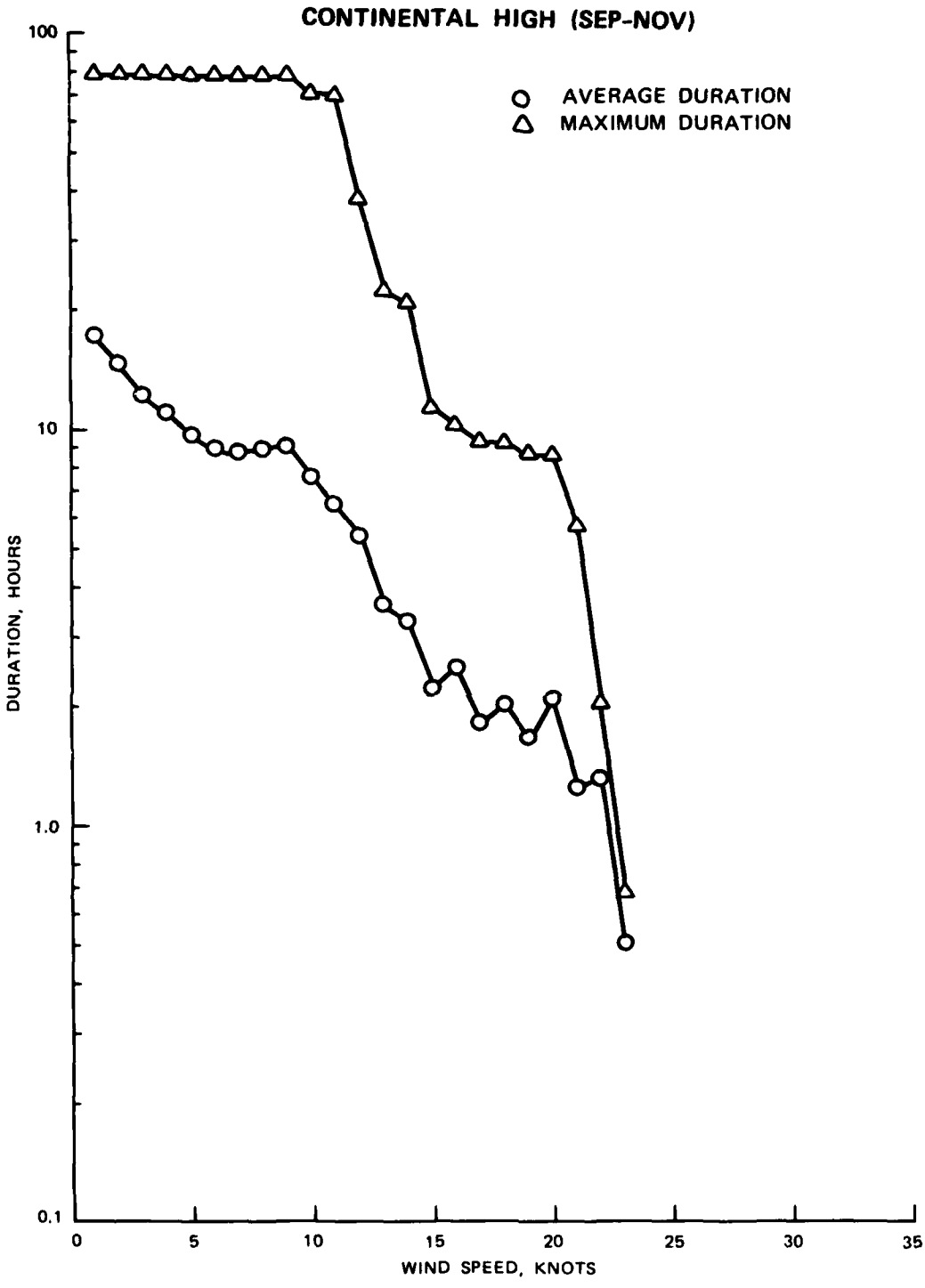


Figure 32. Duration of CH winds during fall

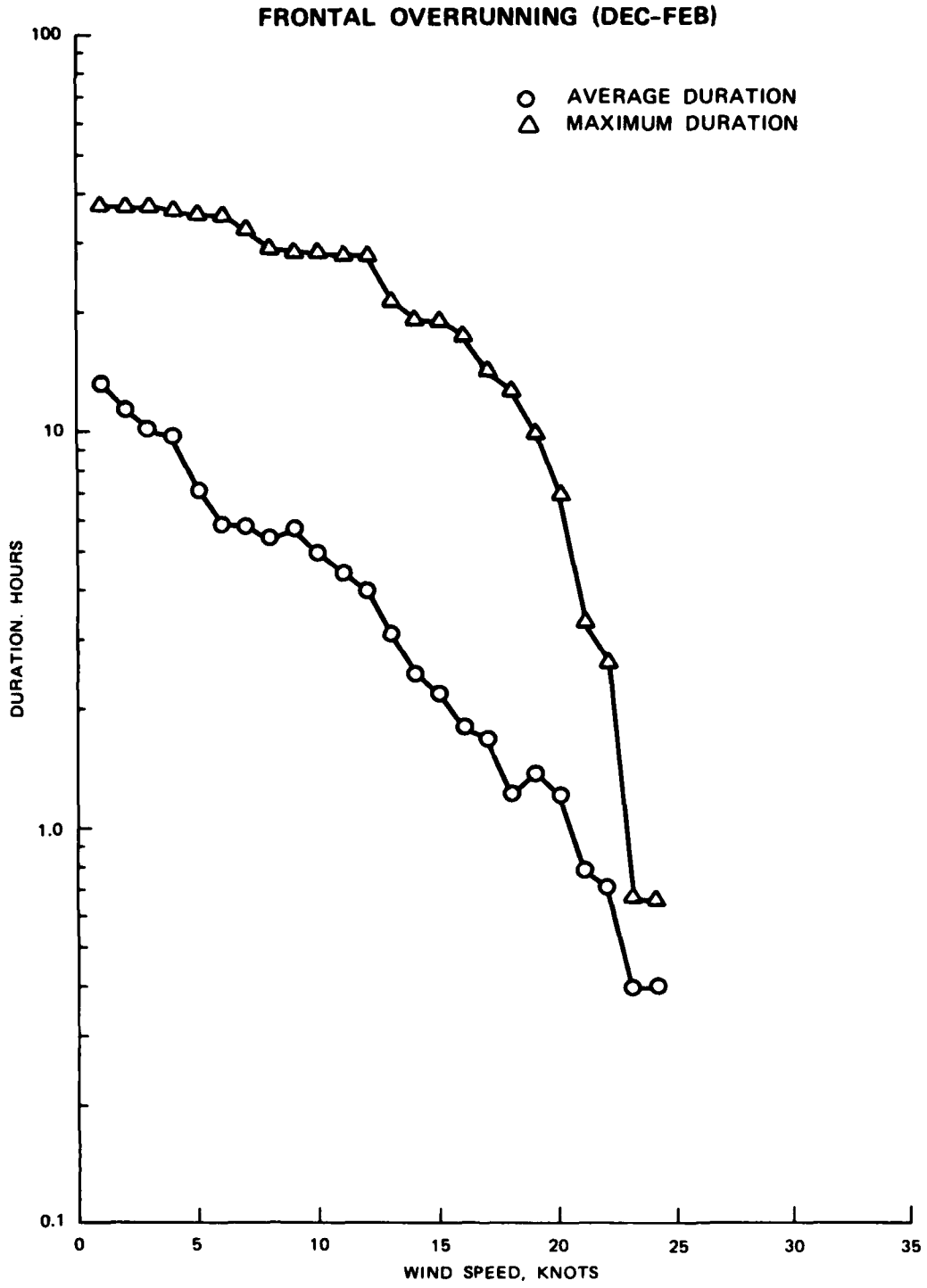


Figure 33. Duration of FOR winds during winter

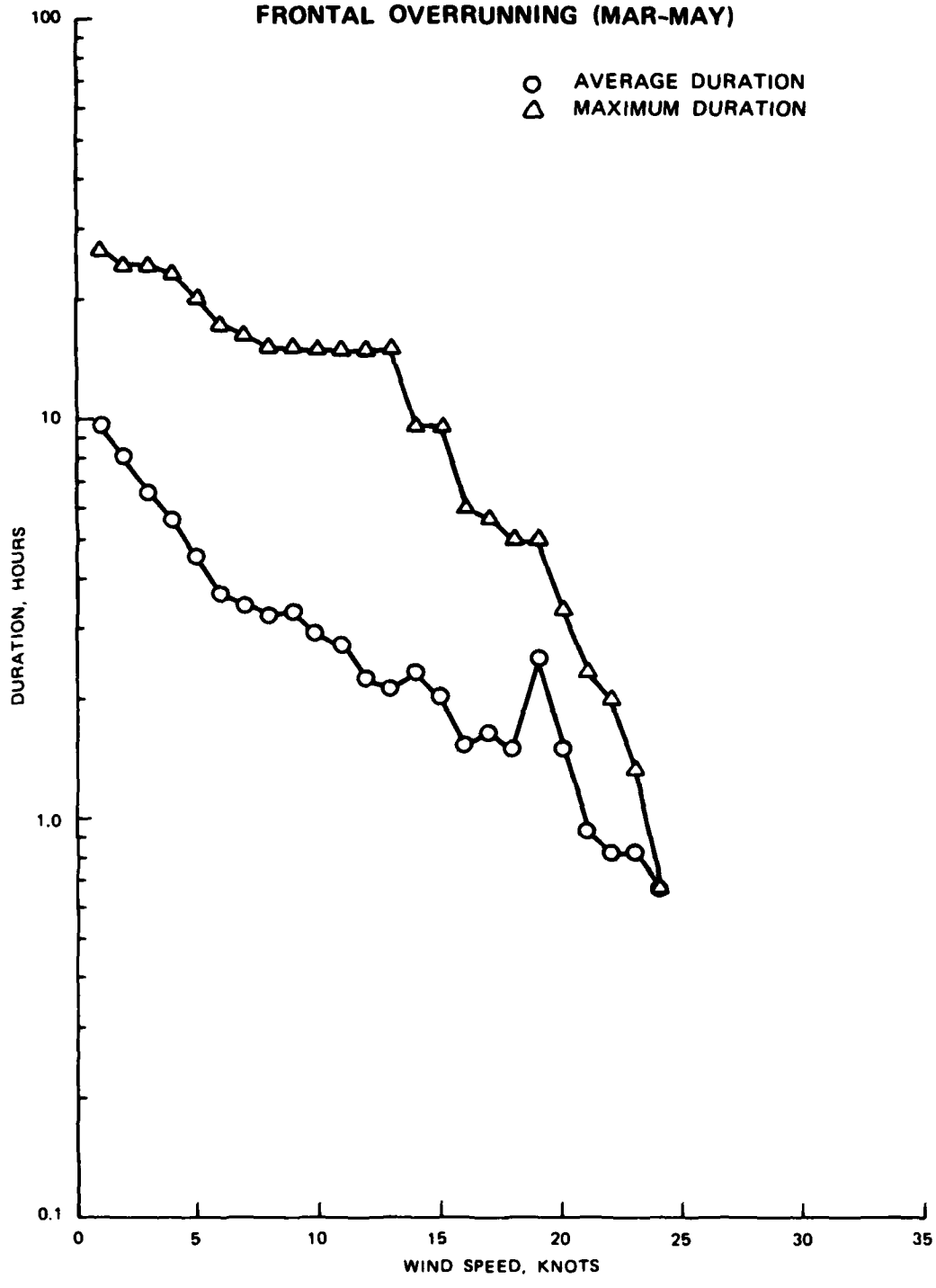


Figure 34. Duration of FOR winds during spring

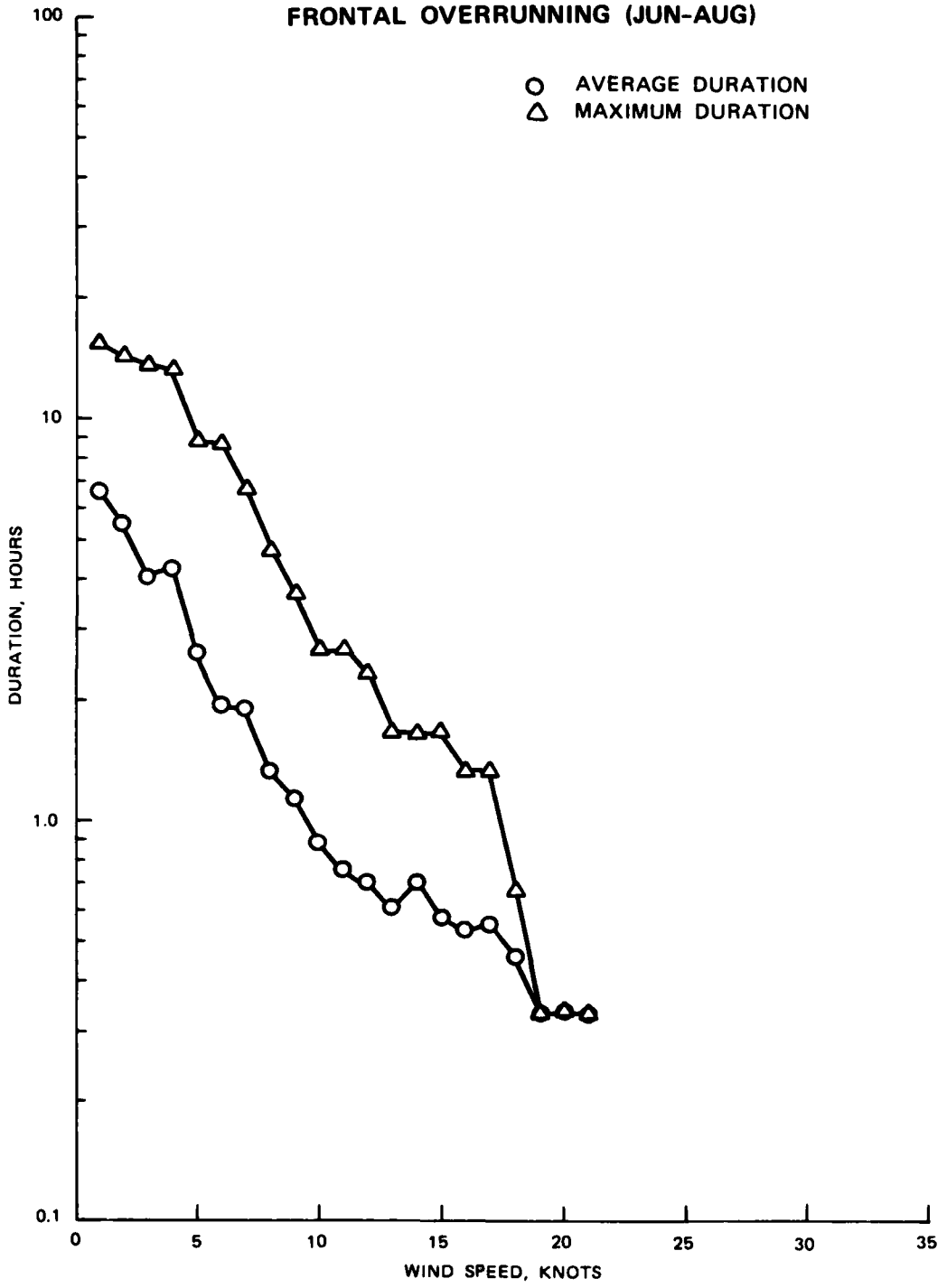


Figure 35. Duration of FOR winds during summer

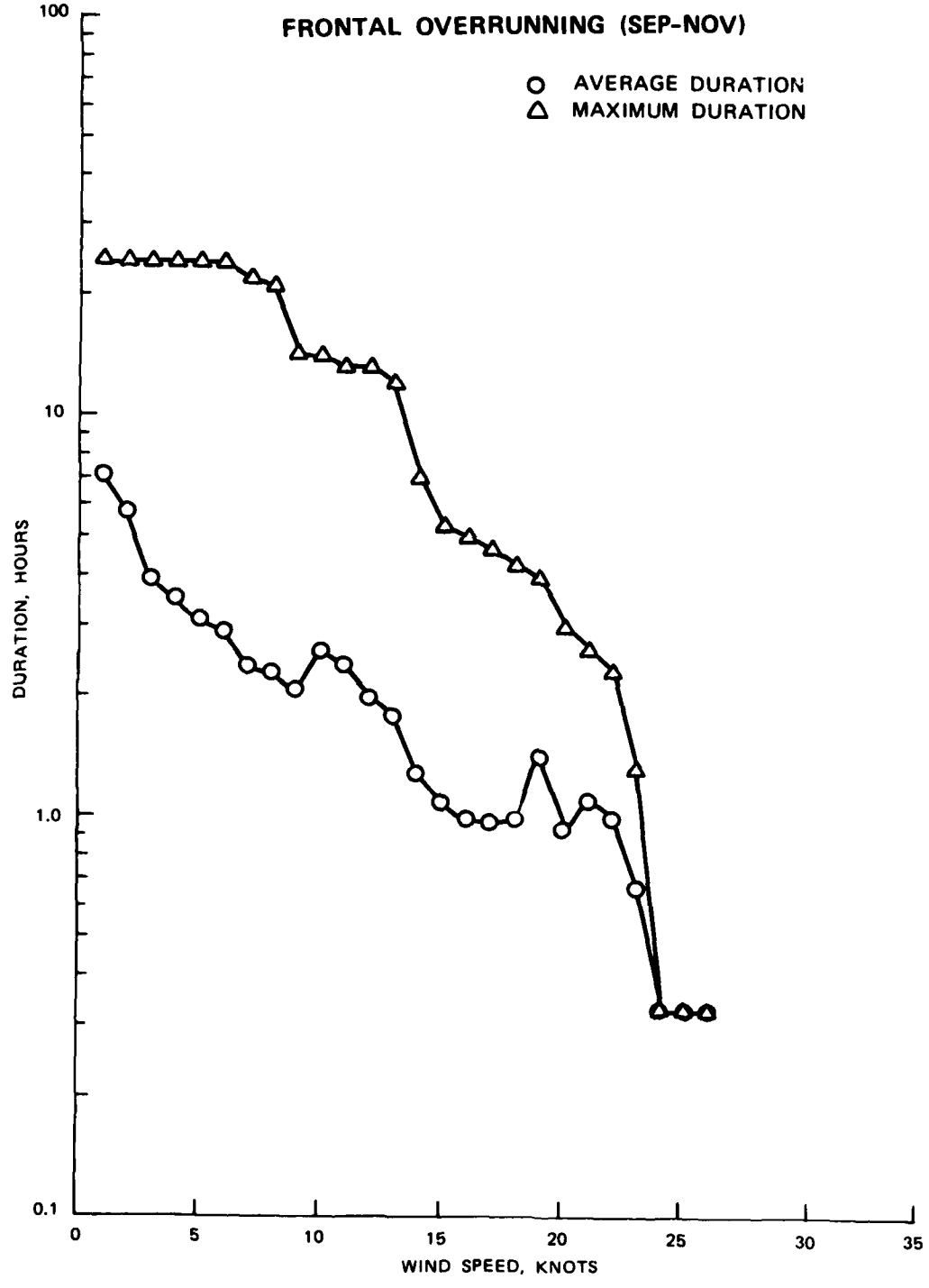


Figure 36. Duration of FOR winds during fall

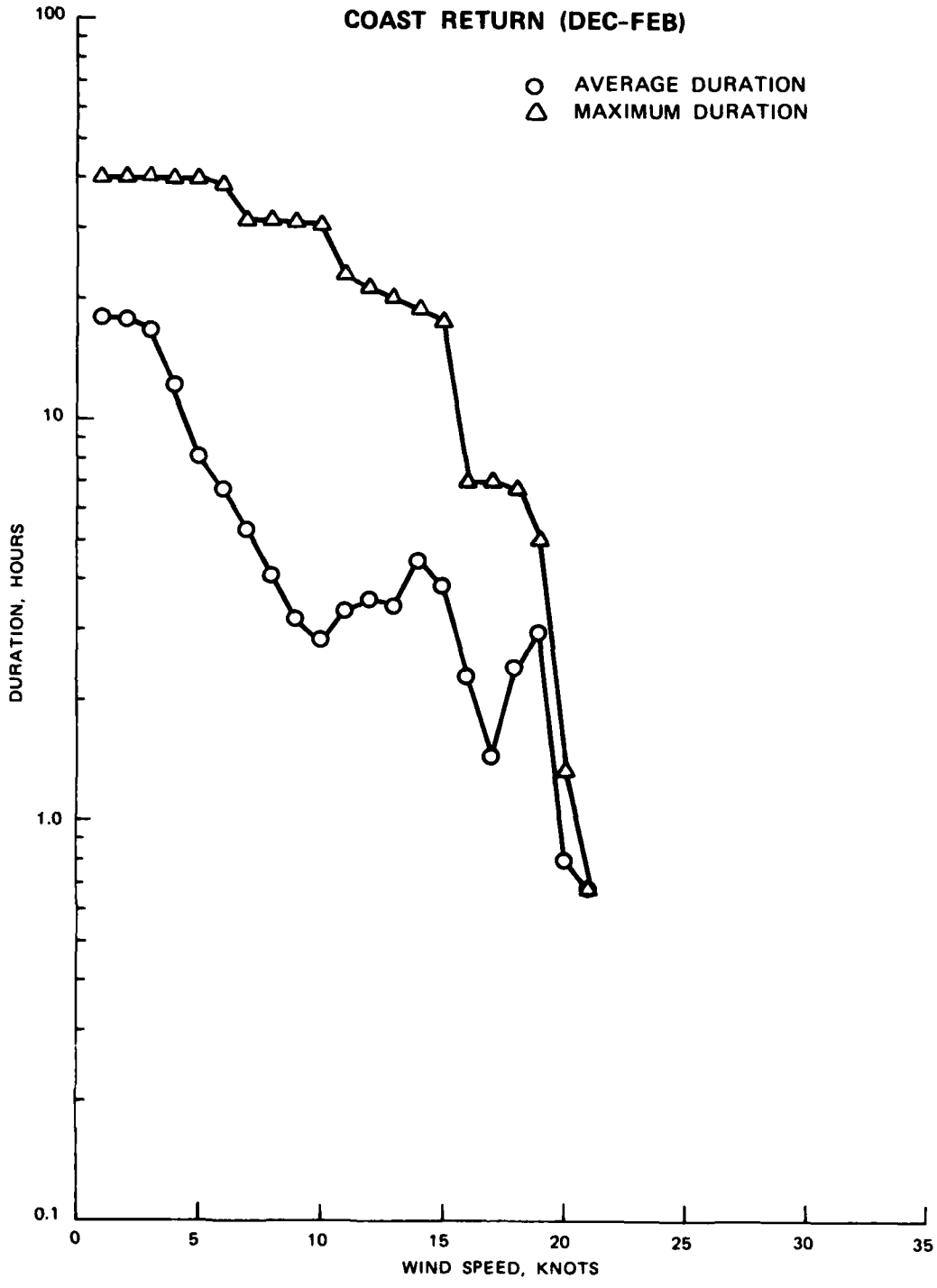


Figure 37. Duration of CR winds during winter

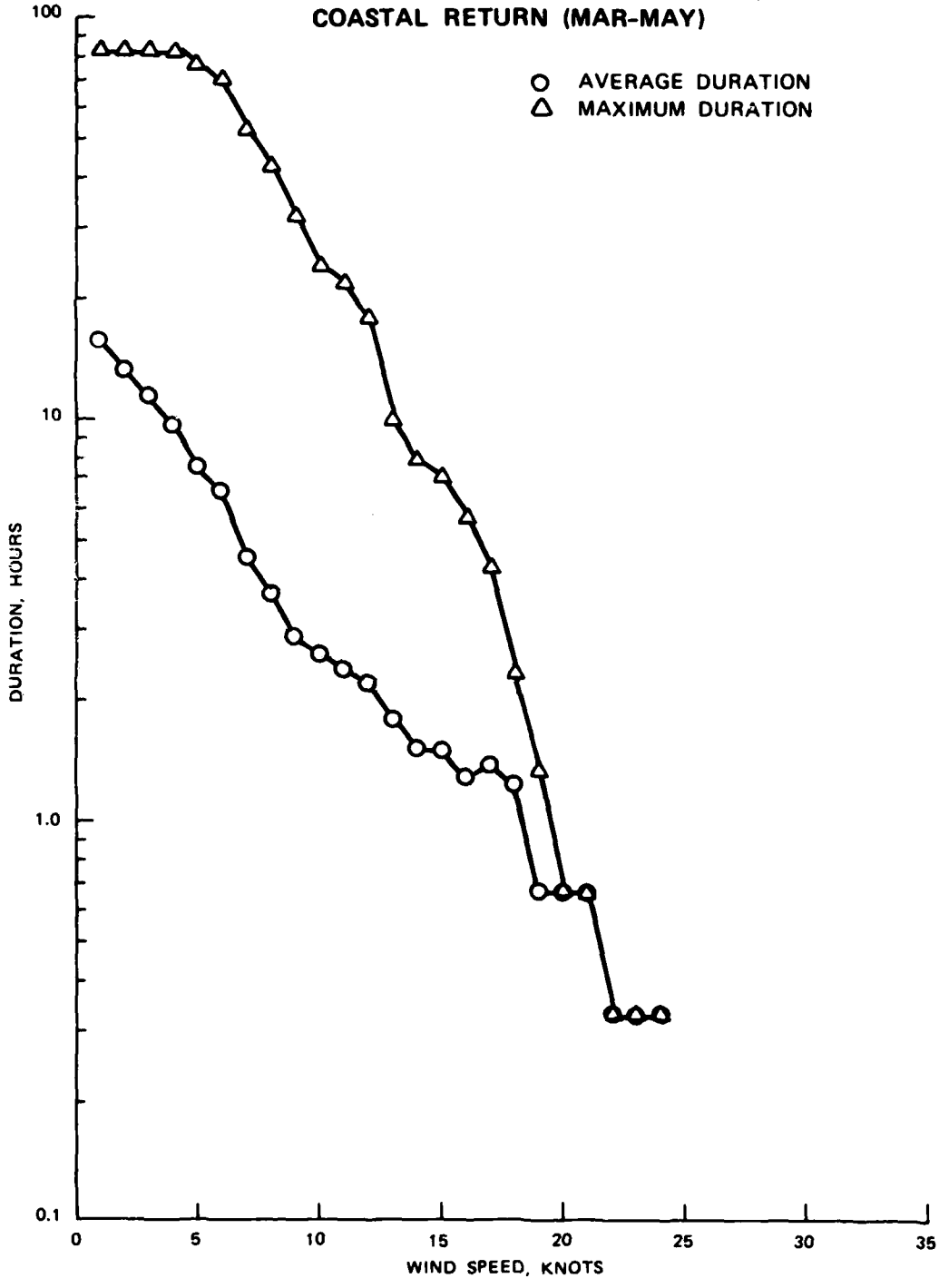


Figure 38. Duration of CR winds during spring

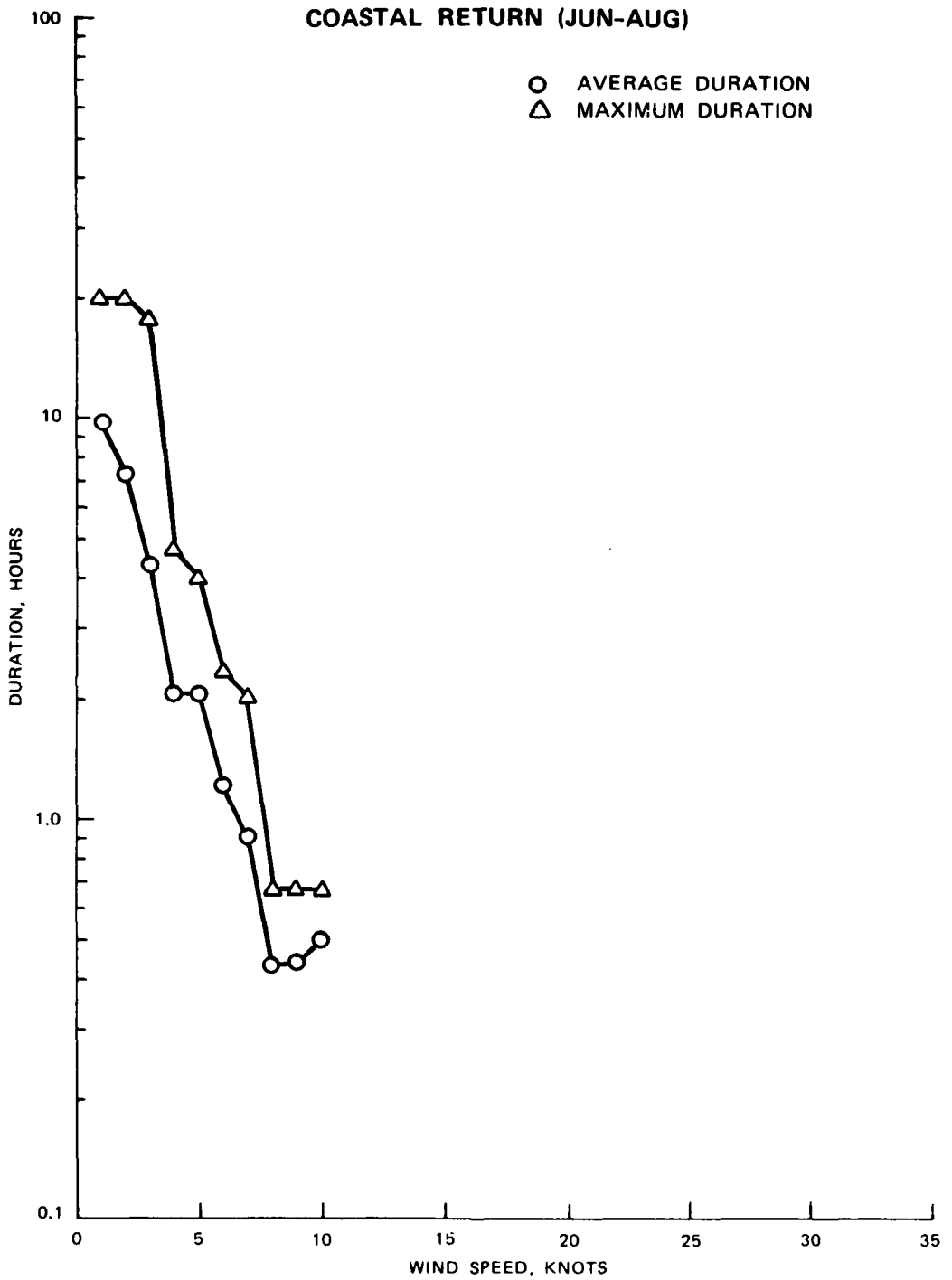


Figure 39. Duration of CR winds during summer

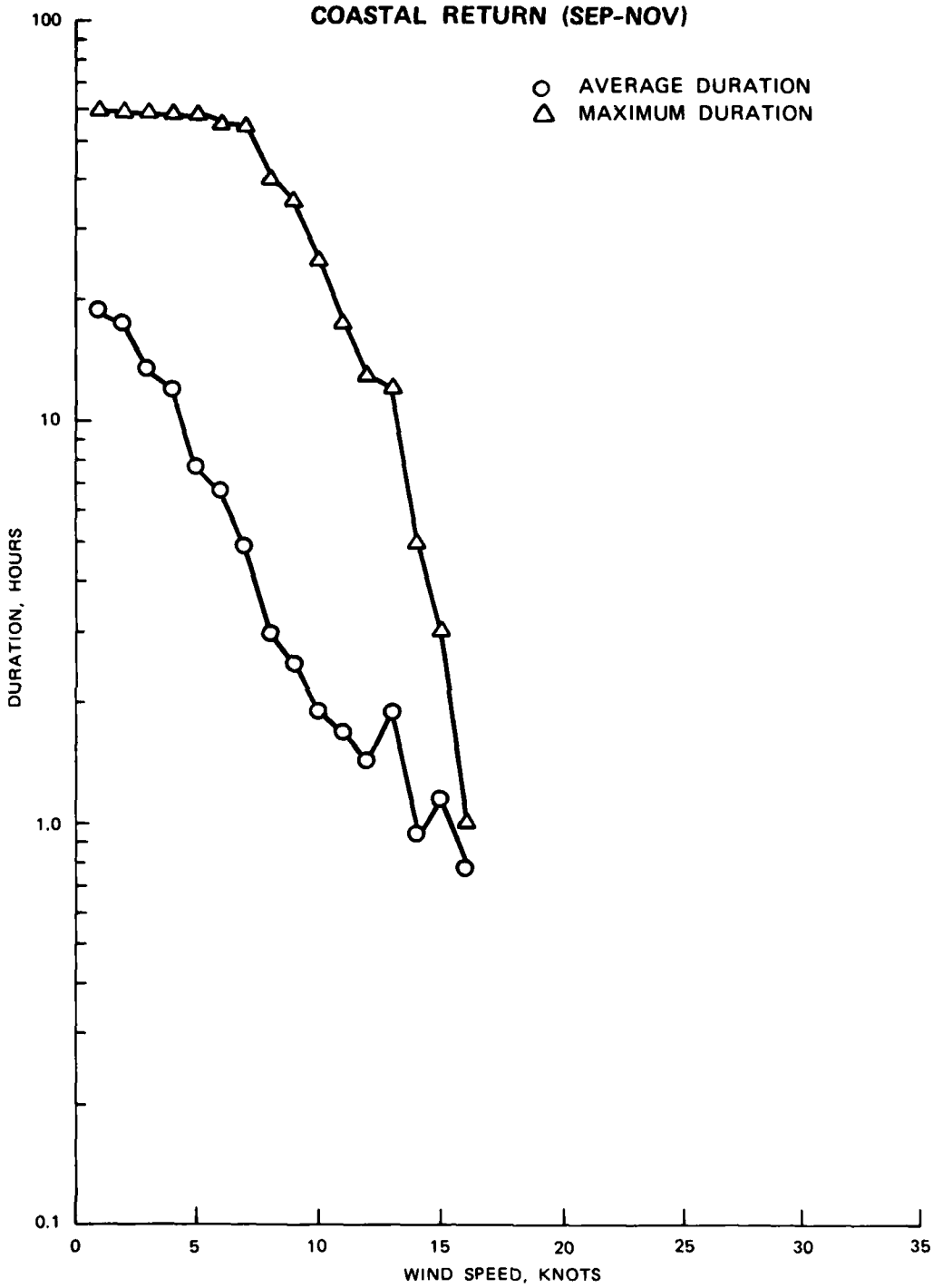


Figure 40. Duration of CR winds during fall

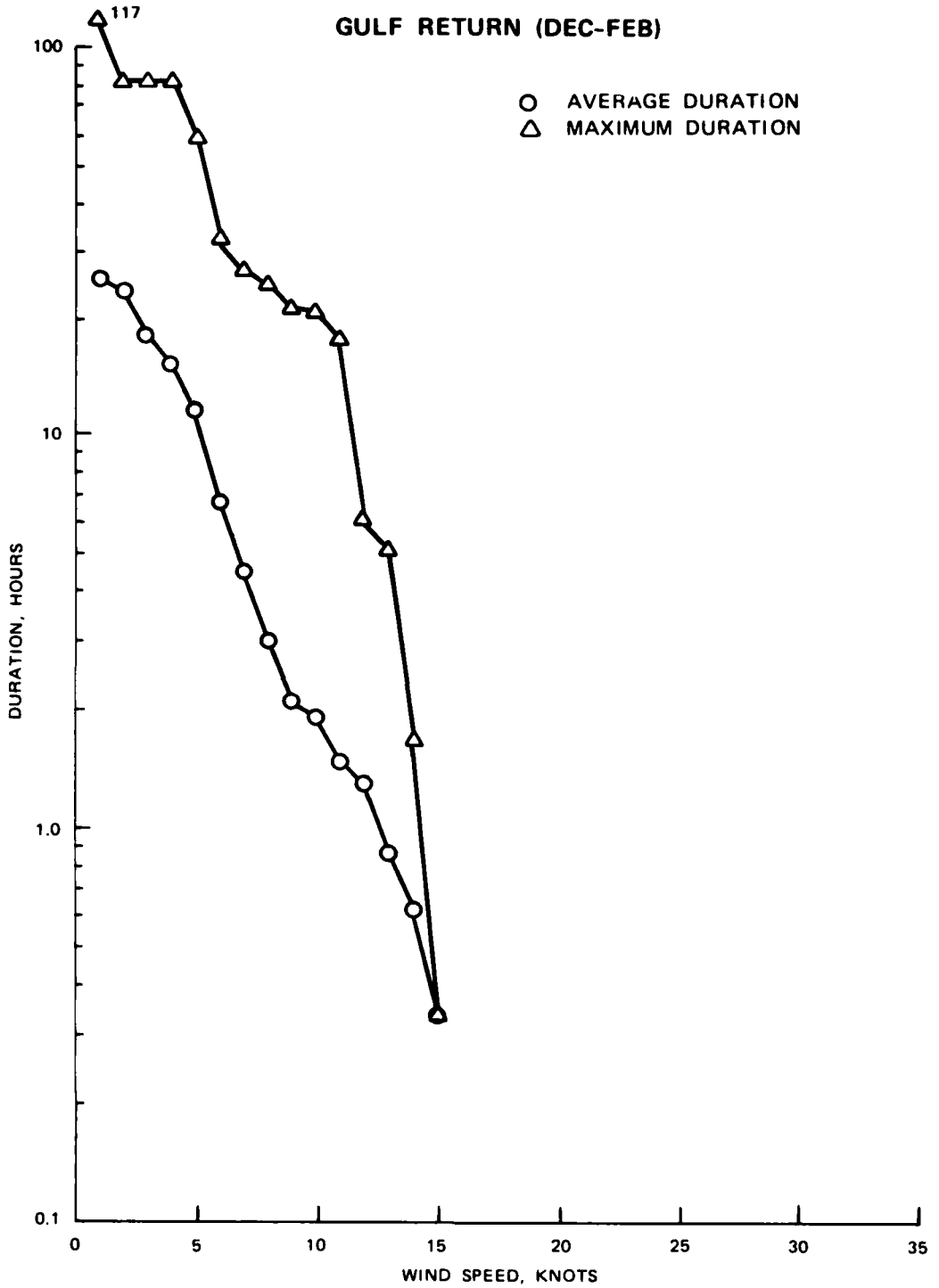


Figure 41. Duration of GR winds during winter

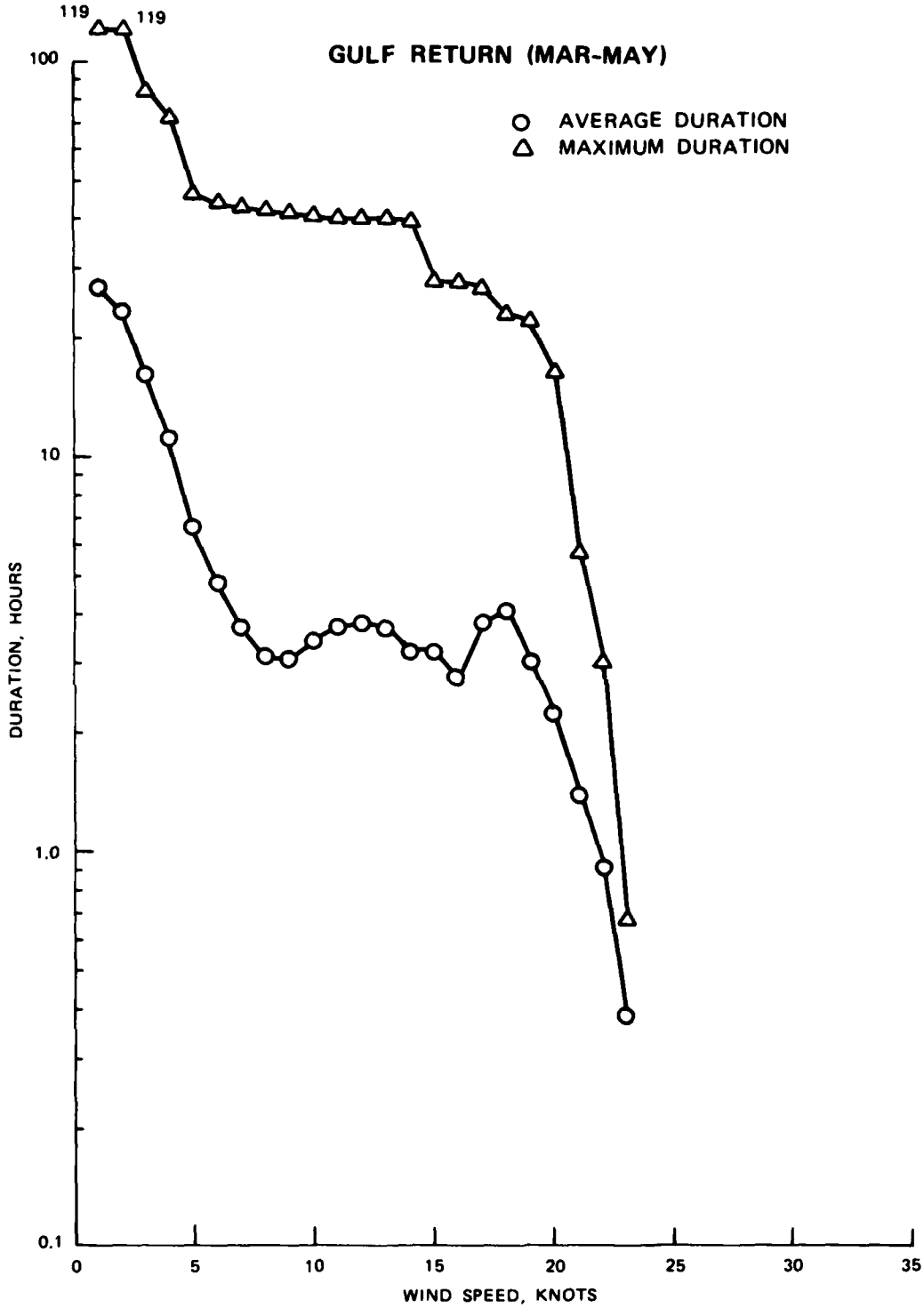


Figure 42. Duration of GR winds during spring

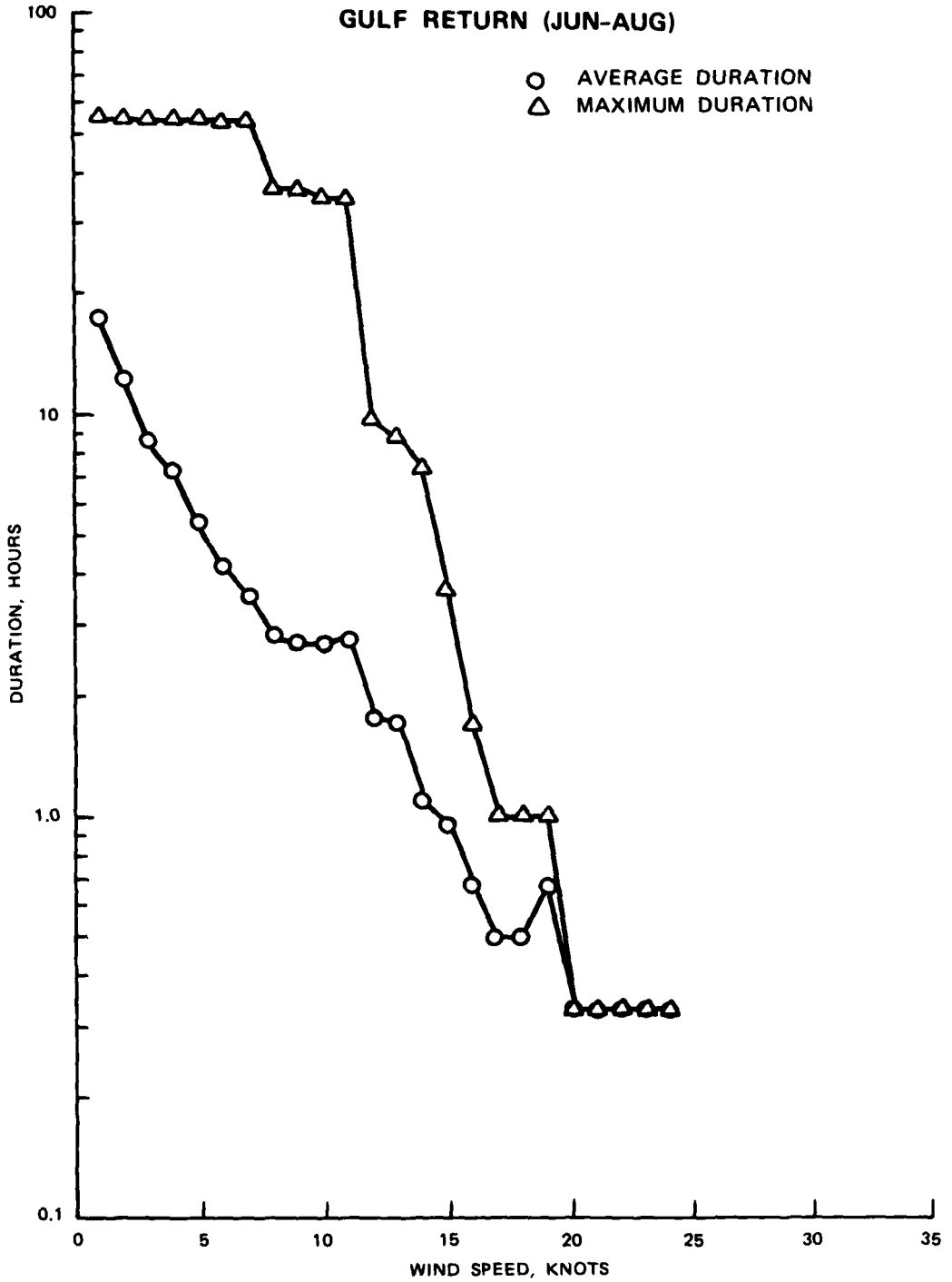


Figure 43. Duration of GR winds during summer

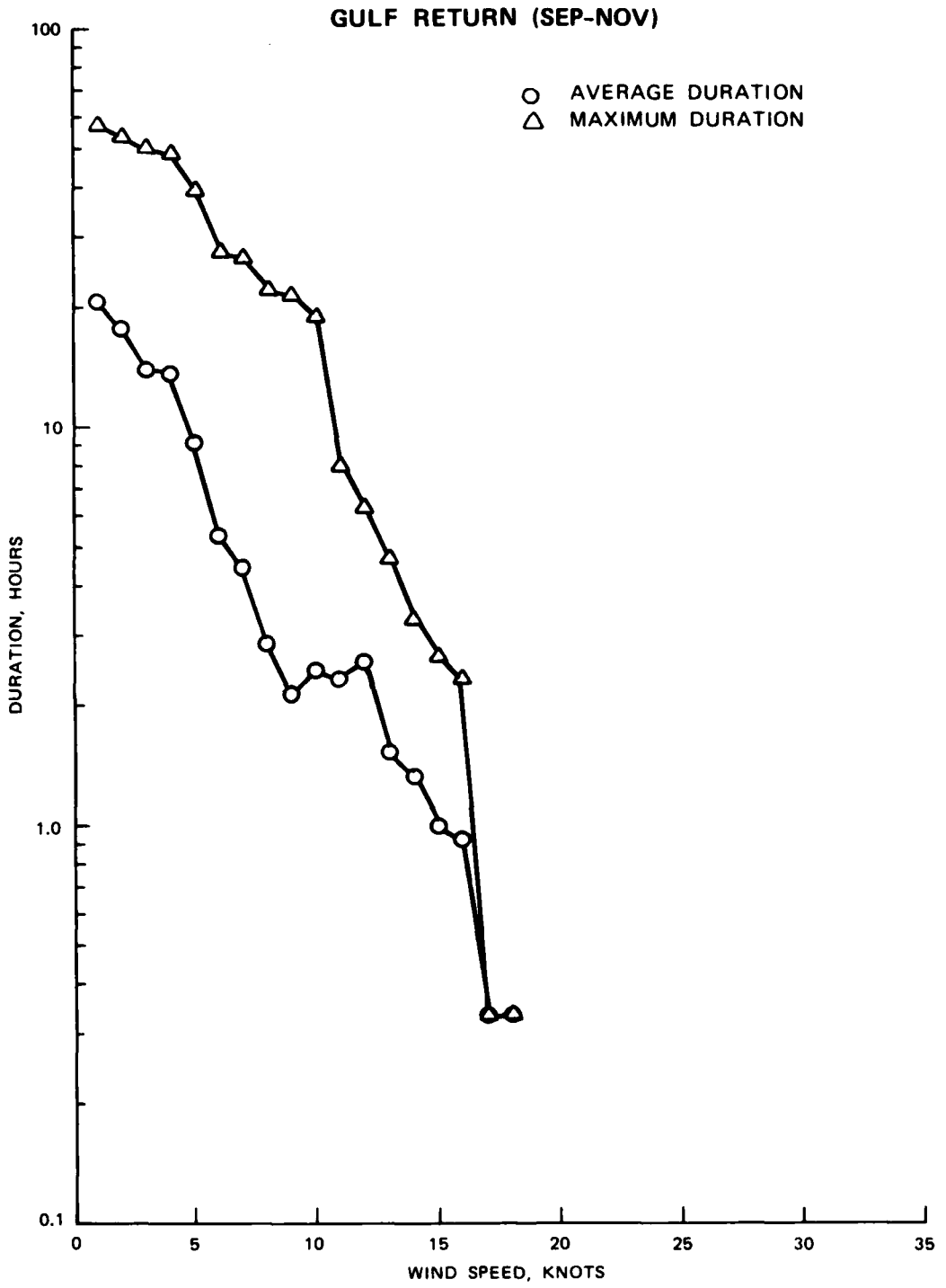


Figure 44. Duration of GR winds during fall

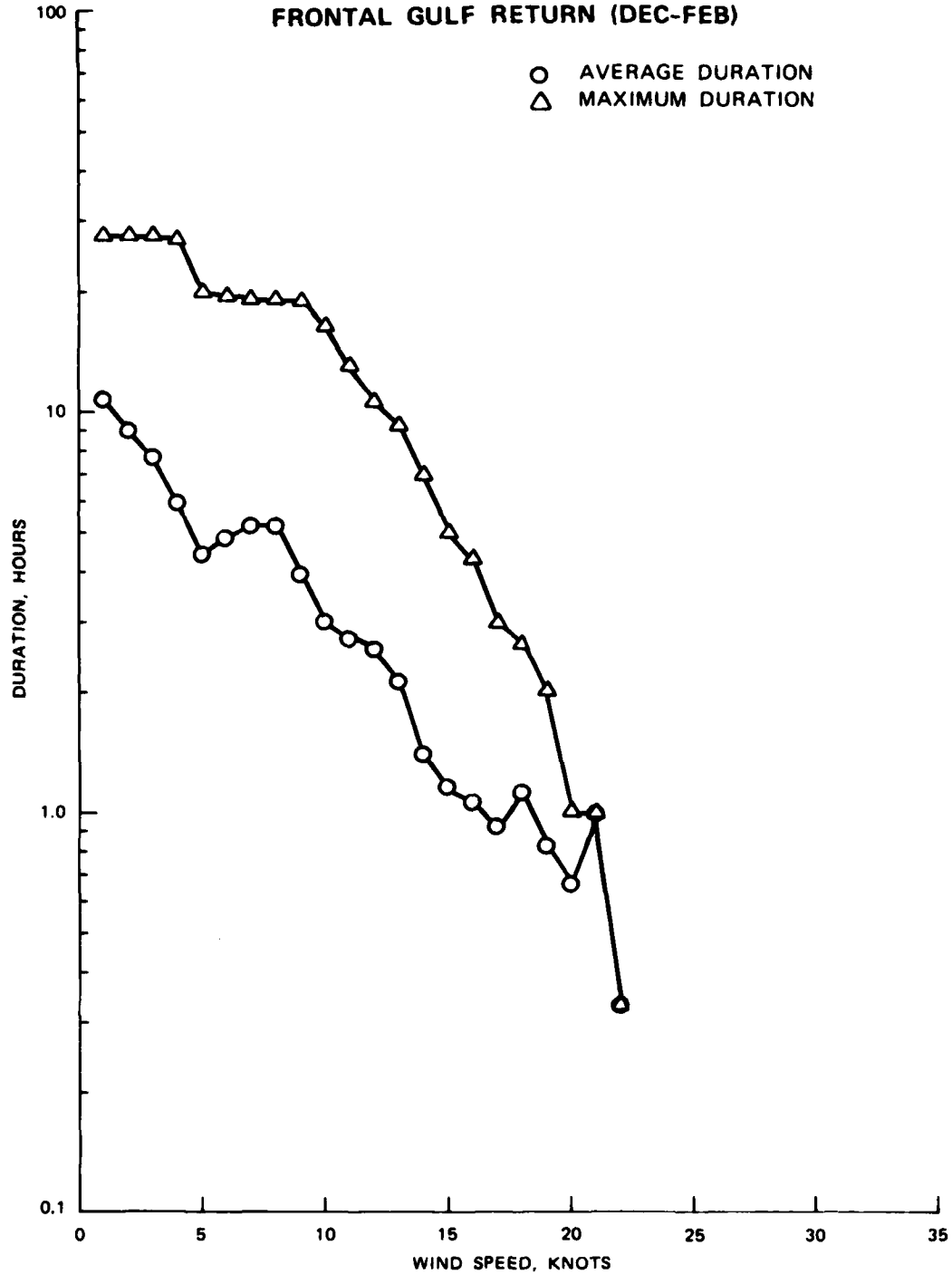


Figure 45. Duration of FGR winds during winter

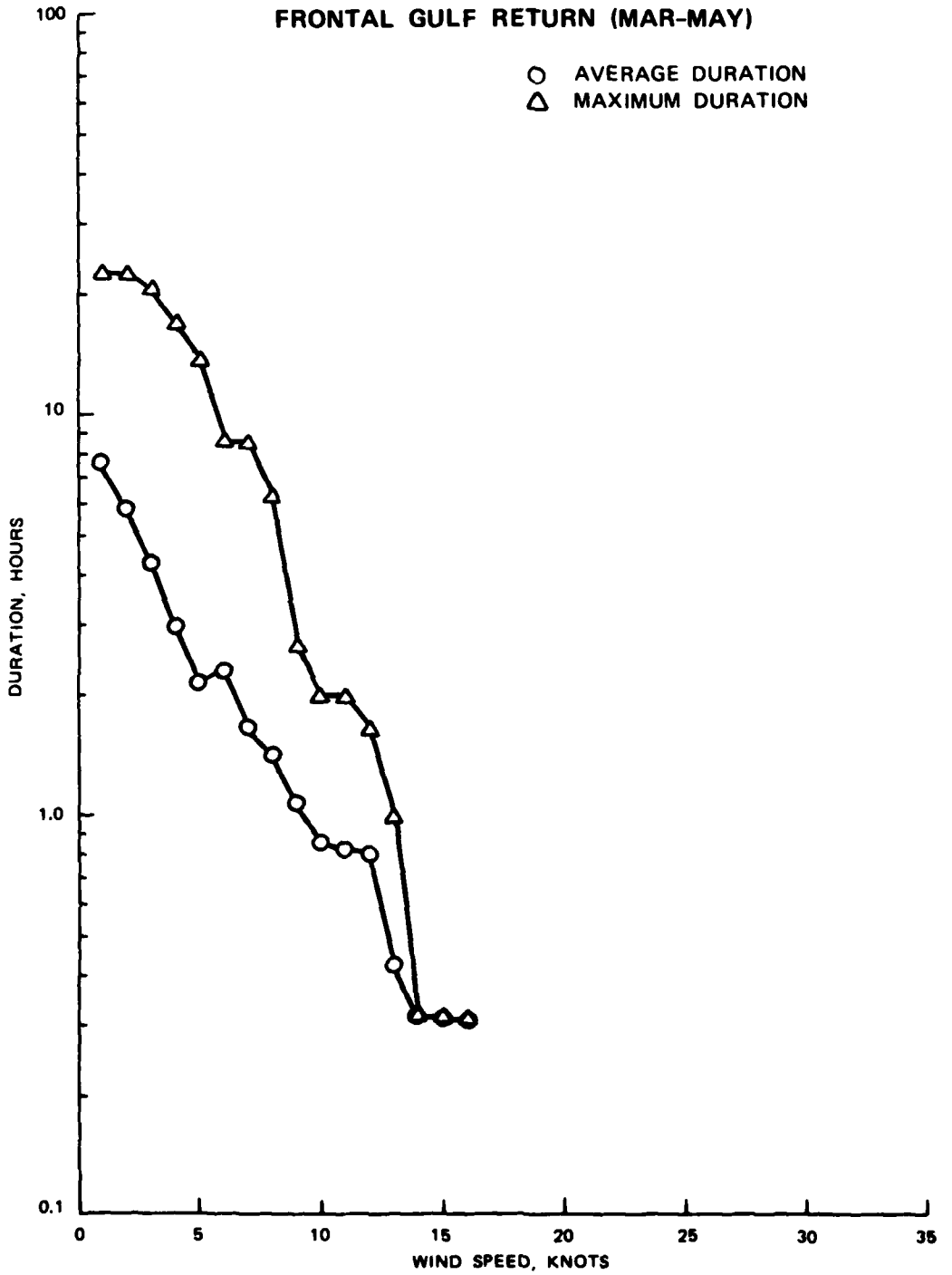


Figure 46. Duration of FGR winds during spring

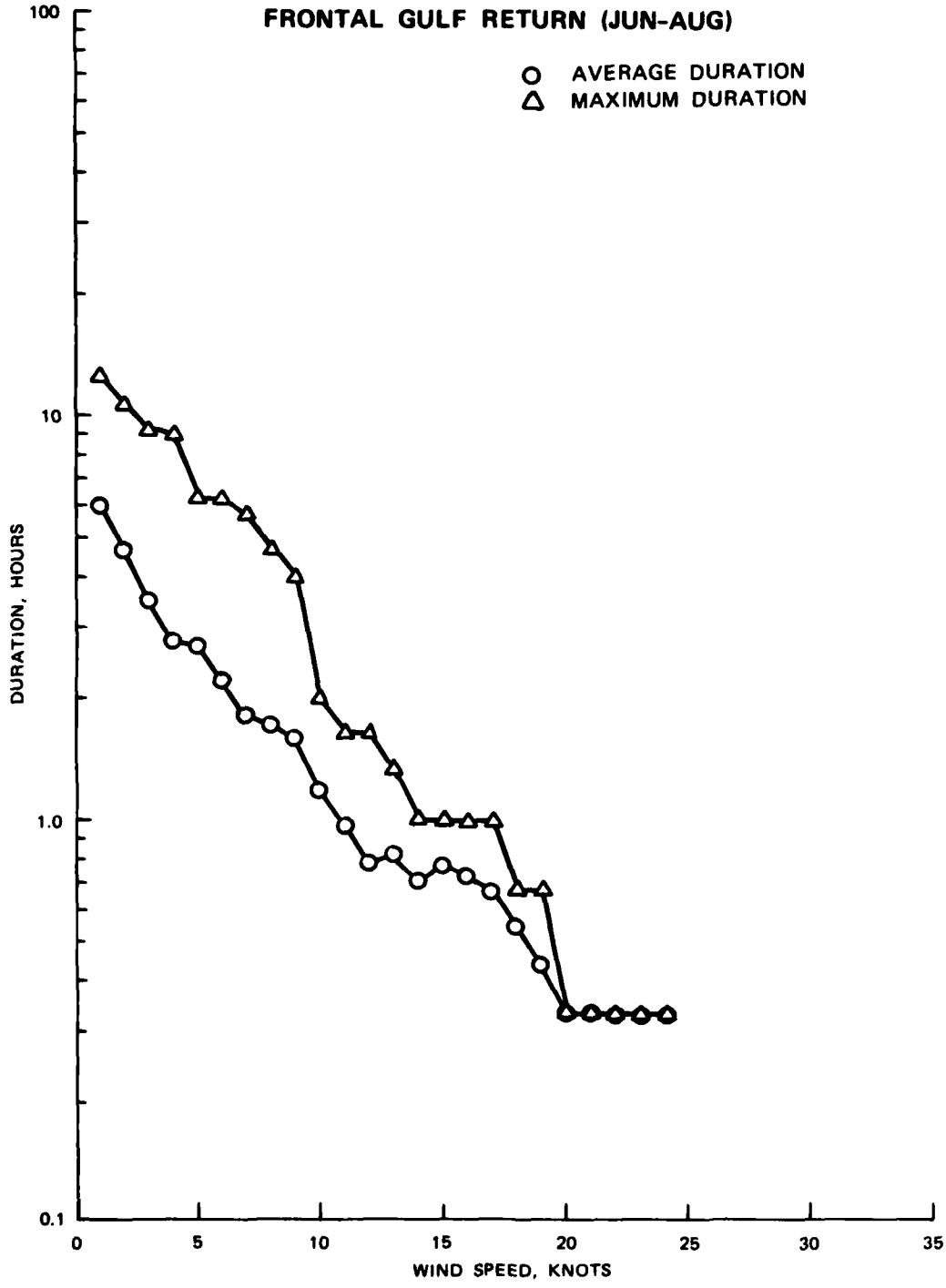


Figure 47. Duration of FGR winds during summer

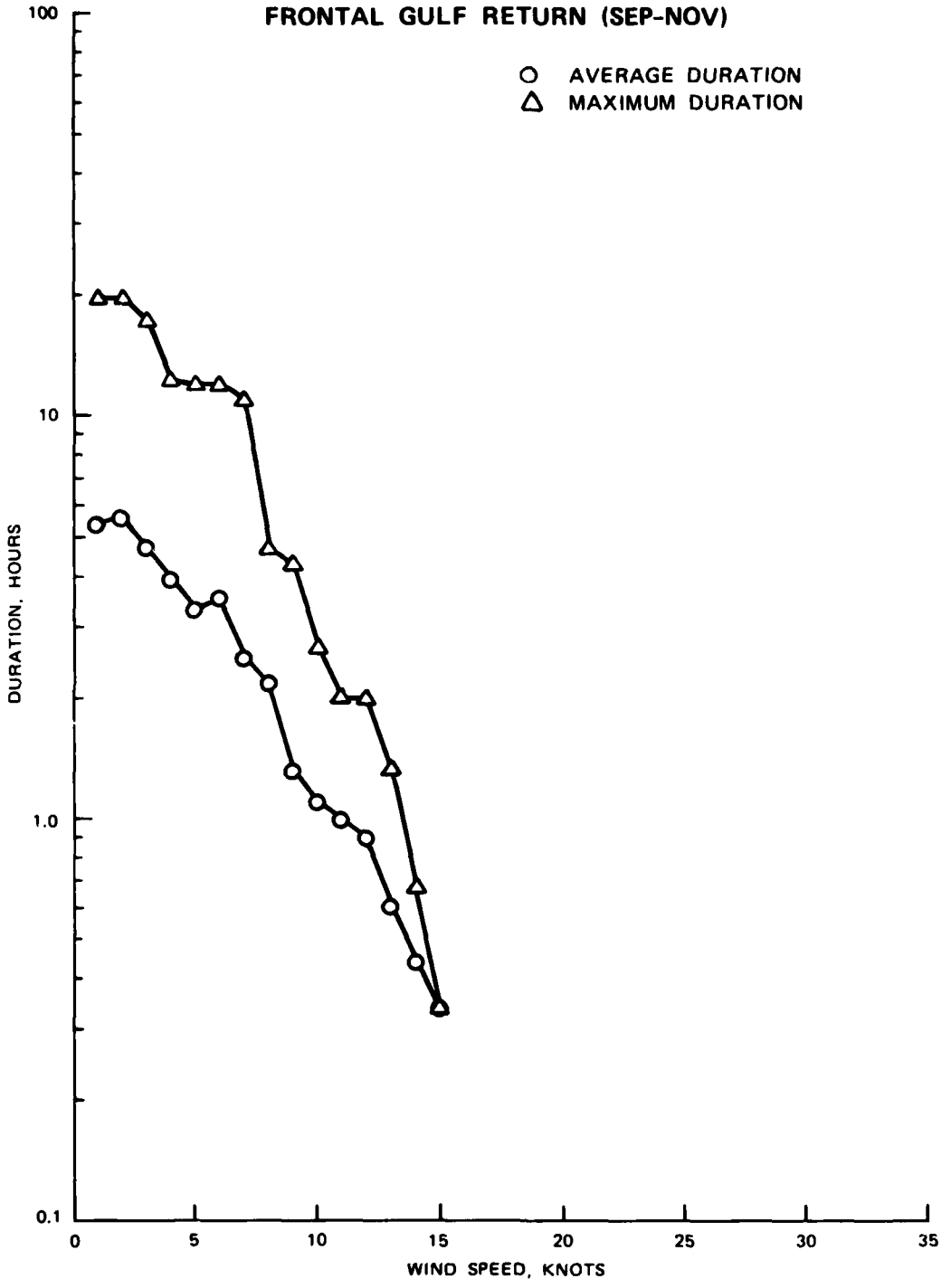


Figure 48. Duration of FGR winds during fall

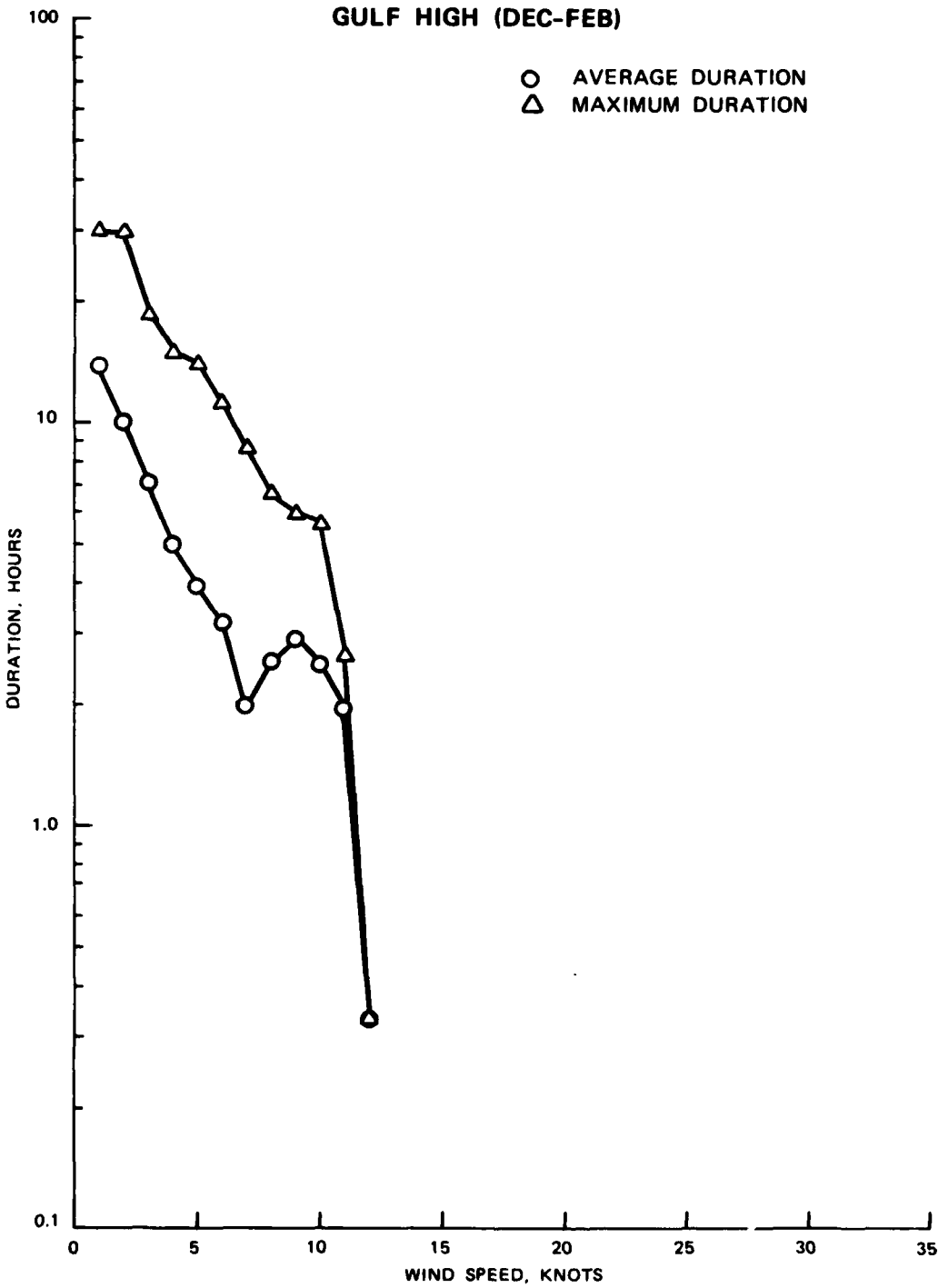


Figure 49. Duration of GH winds during winter

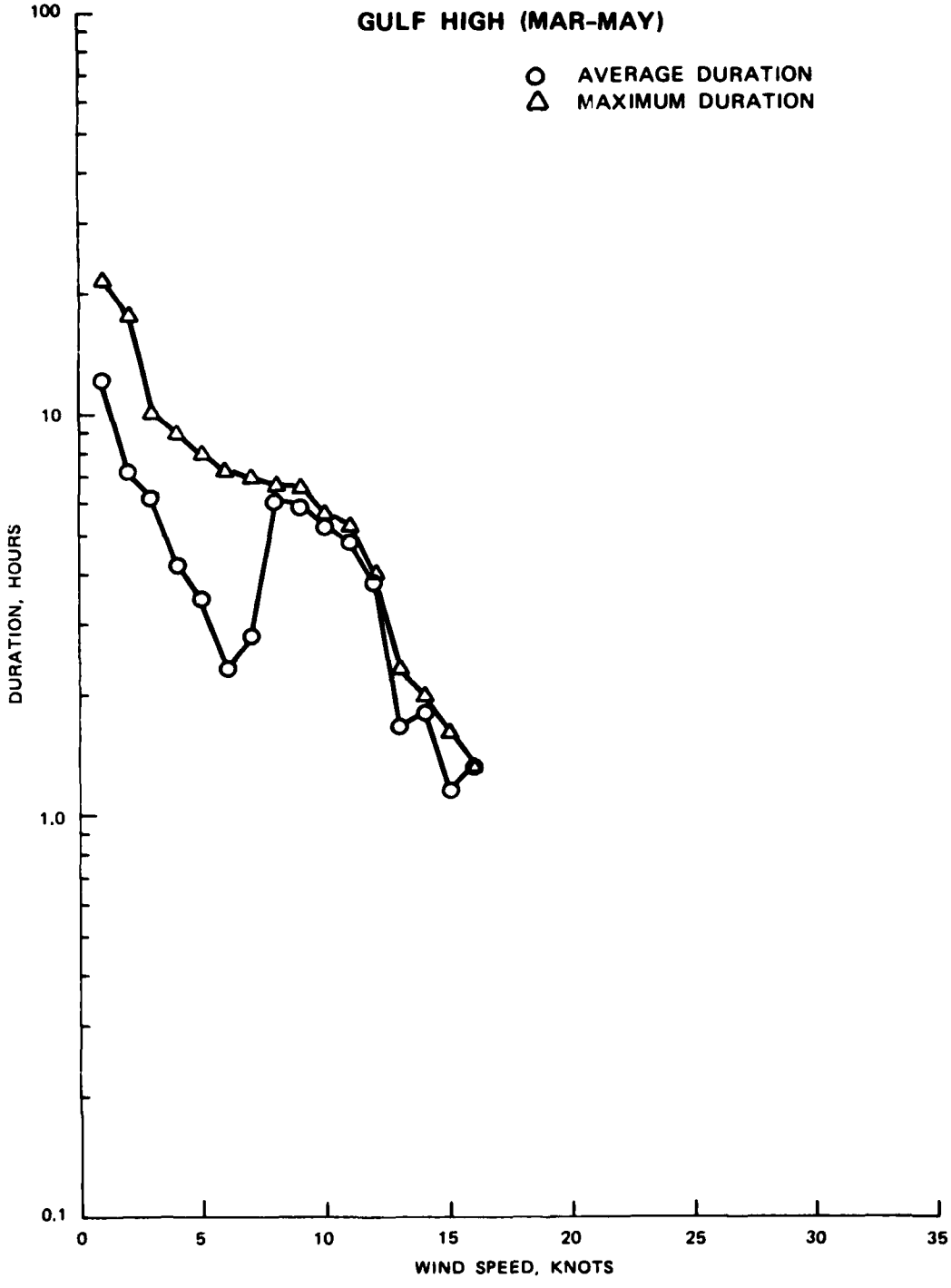


Figure 50. Duration of GH winds during spring

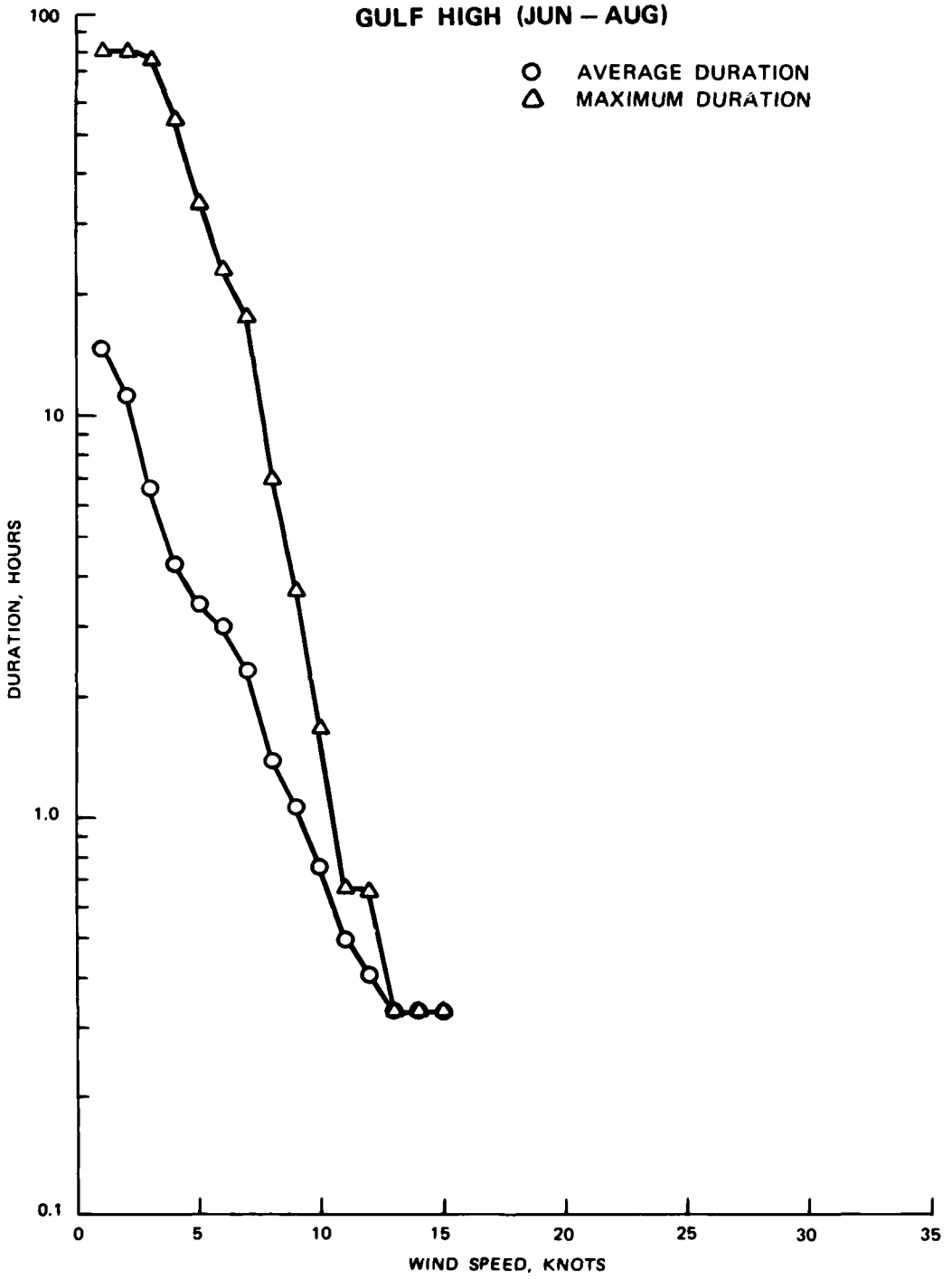


Figure 51. Duration of GH winds during summer

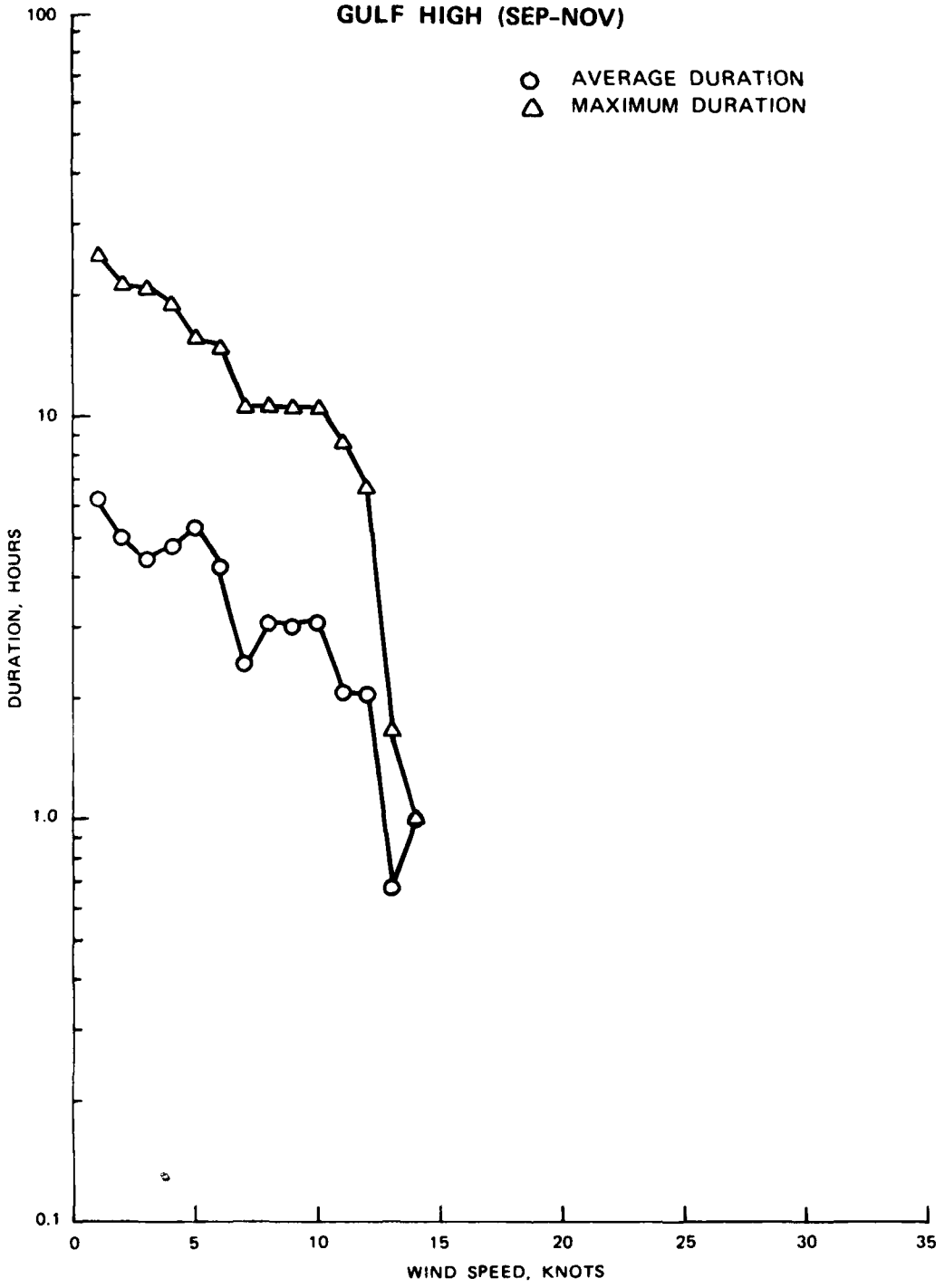


Figure 52. Duration of GH winds during fall

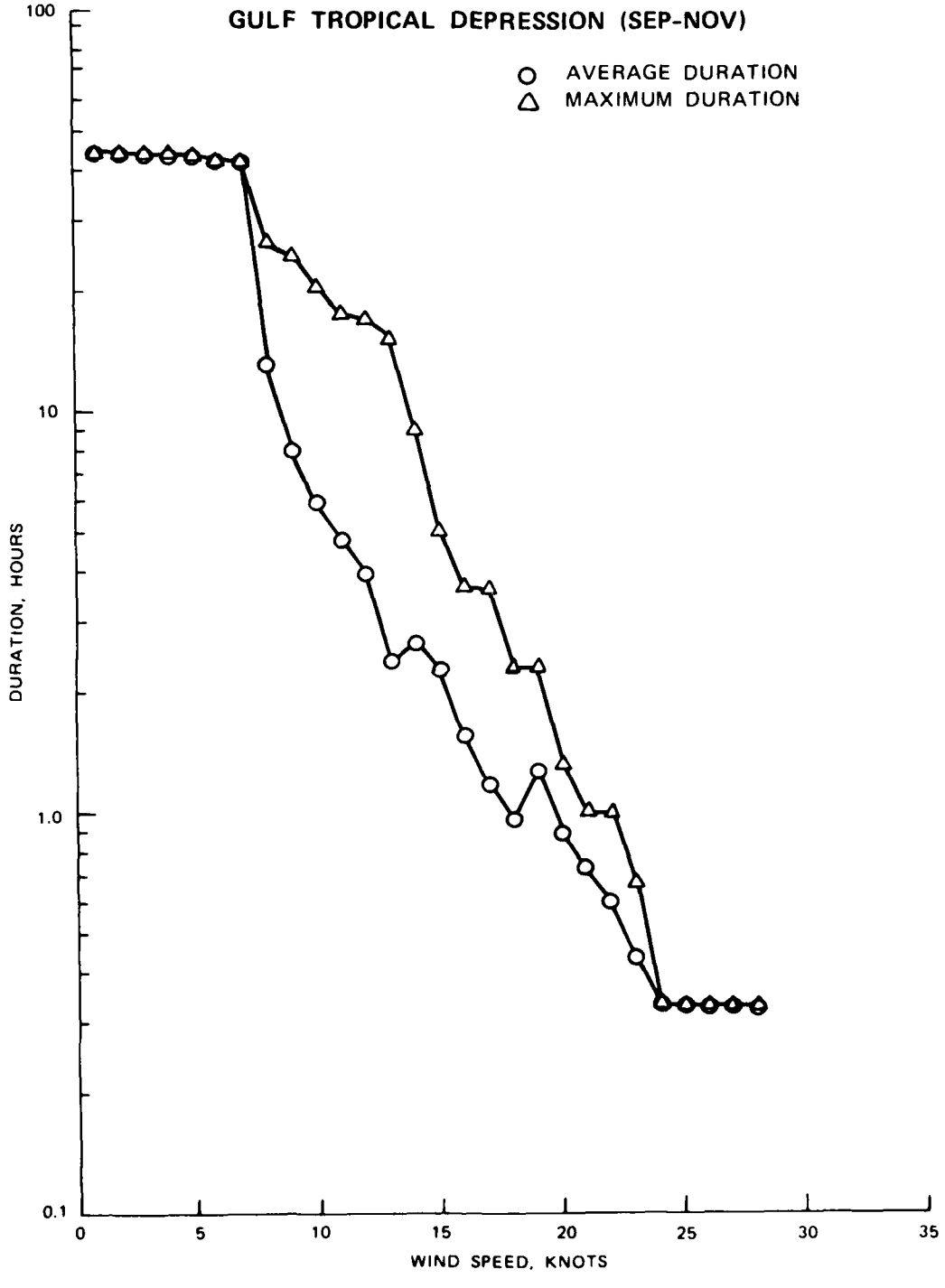


Figure 53. Duration of GTD winds during fall

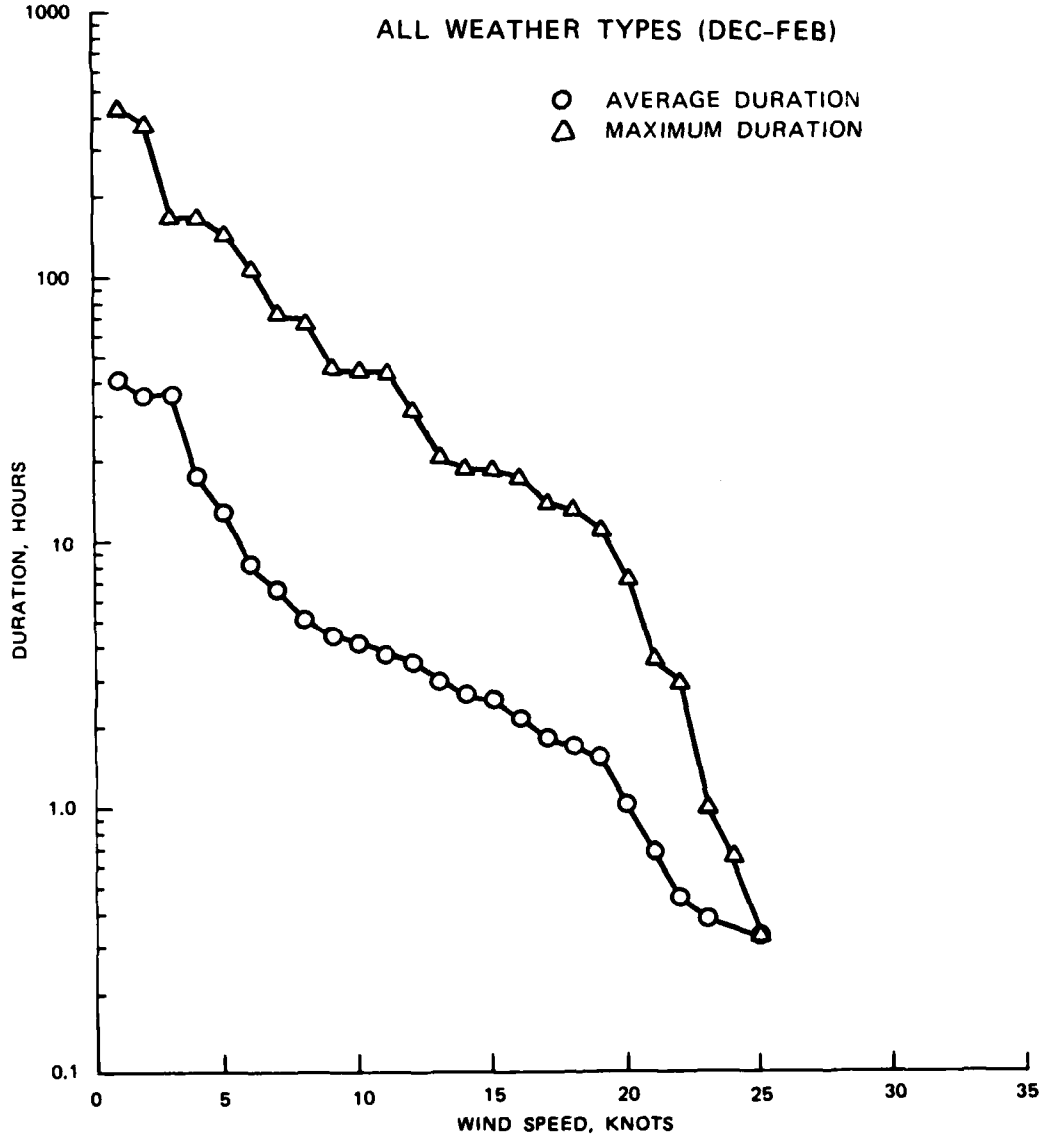


Figure 54. Duration of winds during winter (all weather types)

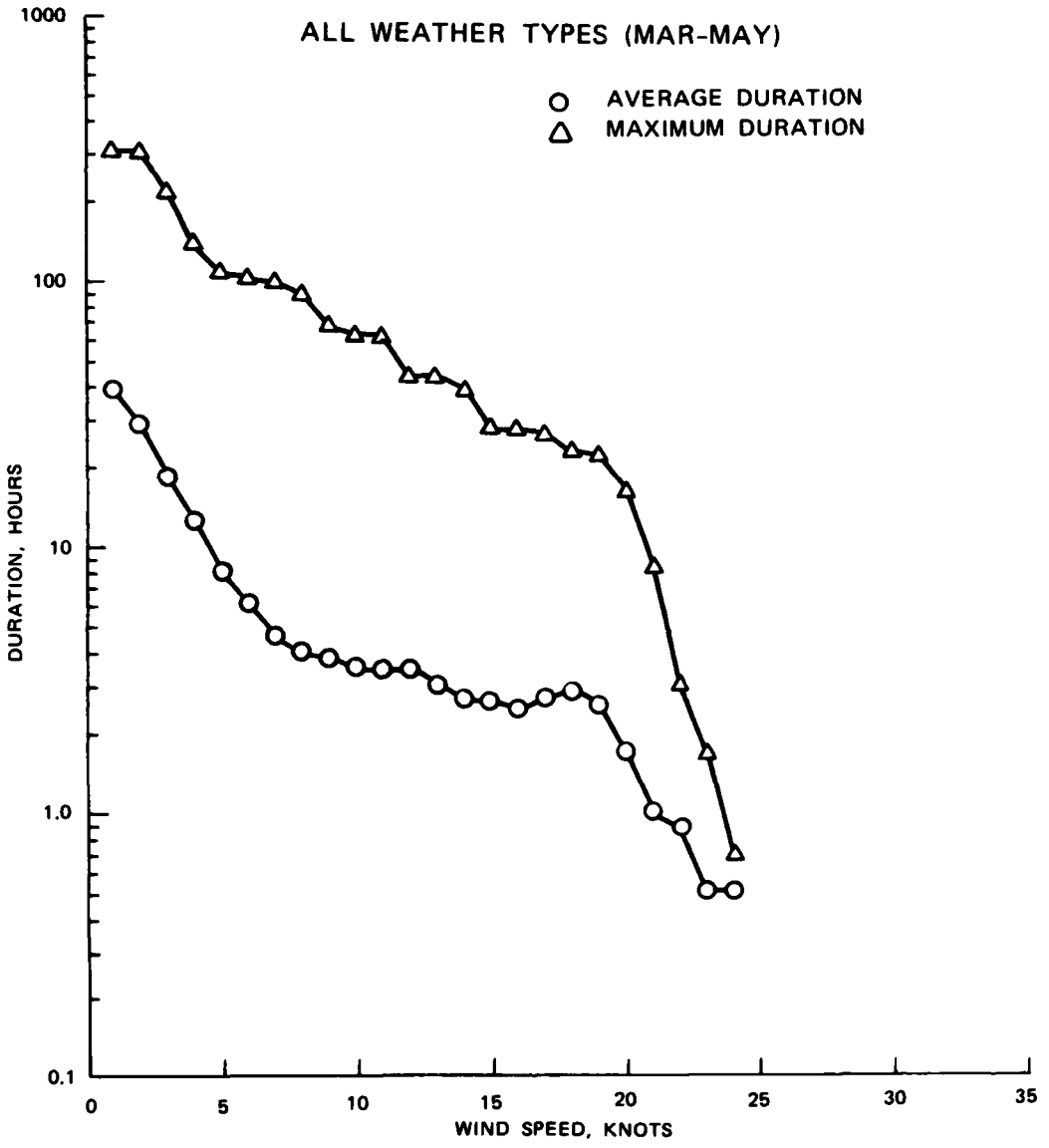


Figure 55. Duration of winds during spring (all weather types)

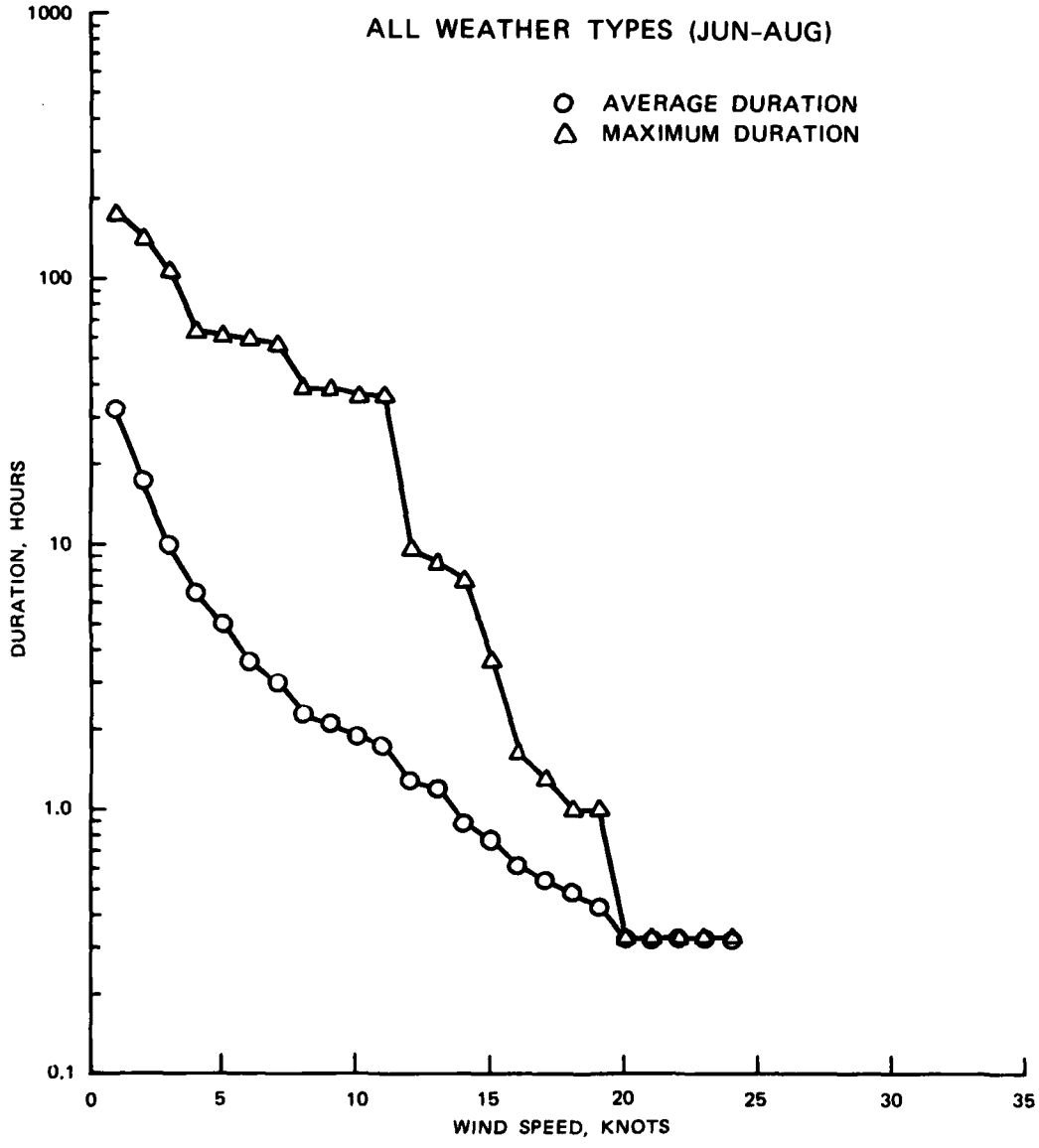


Figure 56. Duration of winds during summer (all weather types)

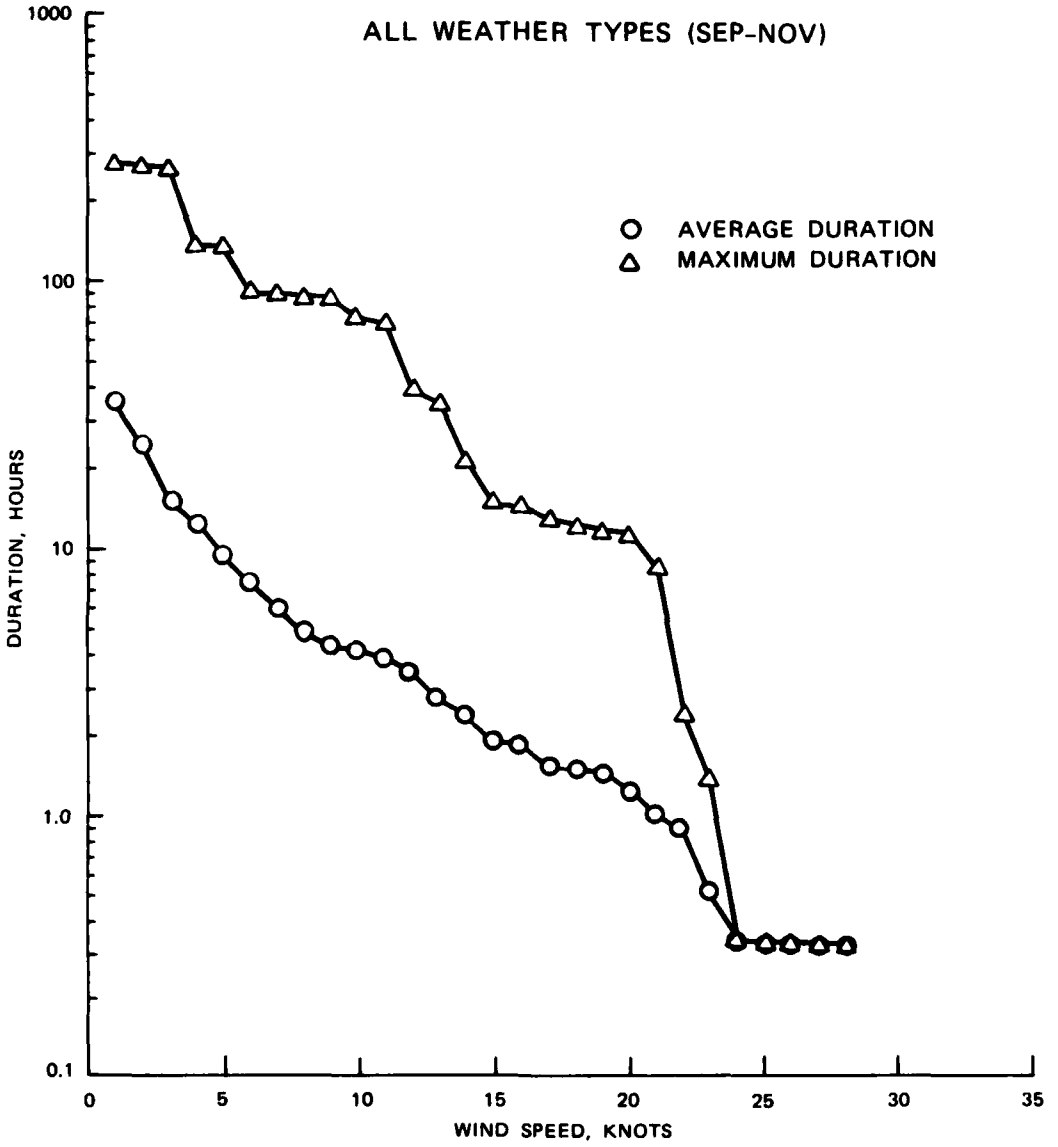


Figure 57. Duration of winds during fall (all weather types)

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